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BEFORE
THE ROYAL COMMISSION
ON
ENERGY



A
SUBMISSION BY
THE BRITISH AMERICAN OIL COMPANY LIMITED
AT
CALGARY, ALBERTA
MAY, 1958

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THE BRITISH AMERICAN OIL COMPANY LIMITED
SUBMISSION
TO THE ROYAL COMMISSION ON ENERGY
SUMMARY

In the following submission we present our estimates of the potential markets for Canadian crude oil, both domestic and export, and our views on the question of how Canada's reserves of crude oil should be utilized in the best interests of the petroleum industry in Canada, considering all segments of the industry, and of the Canadian economy as a whole.

Our views on this question and the conclusions arrived at in the studies we have made in connection with this submission may be summarized as follows:

1. In 1958 total crude oil production in Western Canada for both export and domestic consumption may not exceed an average of 466,000 barrels per day, which would be equivalent to only about 54 per cent of the present producing potential of the industry. X

In our opinion, however, this low level of production anticipated for 1958 is abnormally depressed by several short-term factors, the effect of which will largely have disappeared by 1959. Chief among these are a temporary levelling-off in demand for petroleum products in both Canada and the United States as a result of the current economic recession, and a reduction in inventories by refiners in both countries from the high levels to which inventories had accumulated in 1957. This reduction in inventories by Canadian refiners alone in 1958 we estimate at the equivalent of approximately 36,000 barrels per day of crude oil production over the entire year. X

We anticipate a marked improvement in the situation in 1959, with total production for domestic consumption increasing by approximately 23 per cent, from 366,000 barrels per day in 1958 to 449,000 barrels per day in 1959, with a further increase to 480,000 barrels per day in 1960. With this increase in domestic demand, total production in Western Canada for both export and domestic markets is expected to exceed 549,000 barrels per day in 1959, and 580,000 barrels per day in 1960. X

2. For the longer term, we anticipate a major increase in demand for Canadian crude oil in the Toronto refining area in 1962, as a result of

the development that is planned by industry in this area to be completed and in operation by the beginning of 1962.

This development will, in effect, amount to a further penetration of Canadian crude oil into the Montreal refining area, by the displacement of products refined in Montreal from imported crude oils with products refined in the Toronto area from Canadian crude oils. ?

3. Even without an additional market outlet for Canadian crude oil in the Montreal refining area, we expect that industry production will exceed 68 per cent of producing potential by 1962. An exploration program of something in the order of 1,000 exploratory test wells per year, or approximately the level of exploration activity reached in 1957, will be required to support this anticipated growth in demand.

Any temporary decline in exploration activity which may be due to insufficient revenue from production to finance further exploration will be largely corrected by 1962, even without the Montreal market, which could not be served by a pipe line before 1961 at the earliest.

4. Canadian crude oil is in an excellent competitive position in the major export markets of the Puget Sound refining area of the Pacific Northwest, and in the St. Paul-Minneapolis and Superior refining areas of the mid-western United States.

It is at a very marked competitive disadvantage as against imported crude oils in the Montreal refining area.

If it were necessary for Canadian crude oil, in order to gain entry to the Montreal market, to take a reduction in well-head price to equalize its laid-down cost at Montreal with that of imported crude oils, there would not, in our opinion, be an adequate incentive to the industry in the way of a reasonable return on investment, to find and develop the new reserves that would be required to supply this additional market.

5. In view of the increase in export demand that we feel is likely to take place within the period of our forecast, and because of the competitive disadvantage that Canadian crude oil would have in the Montreal refining area, the industry would, in our opinion, be ill-advised to commit a substantial volume of Canada's crude oil reserves to the Montreal market, and to undertake a capital expenditure of something in the order of \$291 million for pipe line facilities to enable it to reach this market.

This capital expenditure of about \$291 million includes about \$206 million to provide pipe line facilities to supply the Montreal market over and above the capital outlay of \$85 million necessary to expand the capacity of the present pipe line facilities to serve the Toronto-Sarnia refining area.

This expenditure of \$291 million for pipe line facilities would be a relatively small portion of the capital outlay that would be necessary to explore and develop the new reserves that would be required to support the pipe line extension to Montreal.

6. To the extent that the competitive advantage of imported crude oils in the Montreal refining area were reduced by import quotas or tariffs, the refining segment of the petroleum industry in this area, and the Canadian economy in general, would be saddled with a burden of additional cost in supplying the petroleum product requirements of the area served by refineries in Montreal. Moreover, import quotas on crude oil in the Montreal refining area would discriminate against refiners located in this area.
7. With the prospect of an expanding market for Canadian crude oil in the United States over the longer term, and viewing the problem from the standpoint of the Canadian refiner as well as that of the Canadian producer, the entry of Canadian crude oil into Montreal would not be in the best interests of the petroleum industry in Canada or of the Canadian economy in general.
8. Accordingly, it is our recommendation for the utilization of Canada's reserves of crude oil in the manner that will best serve the interest of the Canadian economy as a whole, and of all segments of the petroleum industry in Canada:
 - (a) That every effort should be made by refiners in areas served by existing pipe line facilities to utilize Canadian crude oil to the greatest extent that is economically feasible, and to enlarge the markets supplied from refinery areas served by existing pipe line facilities.
 - (b) That every effort should be made by the Canadian Government through representations at the highest level to the Government of the United States to secure a reciprocal arrangement that would permit the unrestricted flow of crude oil and natural gas between Canada and the United States, to the mutual advantage of both countries.

HISTORICAL GROWTH AND PRESENT STATUS OF THE INDUSTRY

Growth of Reserves and Production

In this section we propose to review briefly the development which has taken place in the petroleum industry in Western Canada in recent years in the way of growth in reserves and production, and to analyze in some detail the factors that affected production in 1956 and 1957, and will affect production in 1958.

In this historical review we have directed our attention mainly to the period 1951 to 1957 inclusive, for which reliable statistical data has been compiled by the Canadian Petroleum Association. Nearly 80 per cent of the total number of exploratory test wells drilled in Western Canada to the end of 1957 were drilled in this period, and approximately two-thirds of the virgin recoverable reserves found in Western Canada to the end of 1957, were discovered in this period.

A summary of available statistical data on reserves, production and exploratory wells drilled for the years 1951 to 1957 inclusive is shown in Schedule I to this submission.

By the end of 1957 the virgin recoverable reserve in Western Canada was 3.785 billion barrels. The cumulative production at this time was 915 million barrels, resulting in a remaining proven reserve on December 31, 1957, of 2.87 billion barrels.

The remaining proven reserve of 2.87 billion barrels is based essentially on primary recovery. Additional reserves from fluid injection or secondary recovery projects were not included unless the additional increase in recovery had actually been demonstrated by the performance of the project. Inasmuch as the majority of the fluid injection projects already underway in Western Canada did not actually go into operation until 1957, most of the additional reserves attributable to these projects were included in the probable category.

Besides additional reserves forthcoming from certain fluid injection projects, probable reserves also include those reserves which can be reasonably expected to result from the extension of the present proven limits of a field, and from increases in the primary recovery factor following additional reservoir performance.

Probable crude oil reserves as estimated by the Canadian Petroleum Association are 822 million barrels.

Total remaining proven and probable reserves for Western Canada are therefore estimated at 3.69 billion barrels.

As demonstrated in B-A's previous submission to the Royal Commission on Energy in February, 1958, it is estimated that the ultimate crude oil reserves in Western Canada to be discovered by primary methods will be about 48 billion barrels. Comparing this figure with the proven virgin recoverable reserves of 3.785 billion barrels, it is apparent that only 8 per cent of the ultimate reserves of crude oil in Western Canada have been discovered to date.

Almost 2.5 billion barrels of new crude oil reserves have been added from 1951 through 1957. These additions to reserves resulted from the drilling of 6,122 exploratory tests, almost 80 per cent of the total of 7,825 exploratory tests drilled in Western Canada to date, including those drilled prior to 1951. The average addition to crude oil reserves per exploratory test drilled during the period 1951-1957 amounted to 404,000 barrels, for an average annual addition to reserves of 348 million barrels over the period. During 1957, 1,058 exploratory tests were drilled in Western Canada.

Producing Potential

Production of Western Canada crude for the year 1946 averaged approximately 18,750 barrels per day; cumulative production to the end of that year was 84,616,000 barrels. After the discovery of Leduc in 1947, production in Western Canada grew rapidly, reaching an average of just over 56,000 barrels per day in 1949. In that year the market demand for crude from Alberta was less than the capacity of the various fields to produce, and for several months a system of purchaser proration was used.

Late in 1950 the Alberta Oil and Gas Conservation Board established a plan of prorating production to market demand, based on the assignment of maximum producing rates to the various fields consistent with applicable reservoir factors and the ability of the fields to produce. This plan with certain modifications is still in use today.

As the producing potential of Alberta grew, new markets were found for Western Canadian crude oil. In 1950 the Interprovincial Pipe Line was constructed from Edmonton to Superior, linking Alberta oil with refineries in Saskat-

chewan, Manitoba, and at Superior, Wisconsin. Lake ships transported oil during periods of open navigation to the Sarnia and Toronto refining areas.

In 1953 the Trans Mountain Pipe Line was completed and commenced deliveries of Alberta crude to the Vancouver area. Two years later it was extended to the U.S. Pacific Northwest. The Interprovincial Pipe Line was extended from Superior to Sarnia in 1953 and to Toronto in 1957.

In 1953 oil production in Saskatchewan and Manitoba began to increase sharply. Oil from this area is now supplied to local refineries and also transported through the Interprovincial and Minnesota pipelines to the St. Paul-Minneapolis, Superior and Ontario refining areas. Production from the two provinces increased from an average of 9,450 barrels per day in 1953 to 112,500 barrels per day in 1957.

A summary of the growth in production and the ability of Western Canada to produce is shown below:

	Average Production Rate Barrels per day	Average Producing Potential Barrels per day	Production Rate as Percent of Producing Potential
1946	18,750	18,750	100
1947	18,950	18,950	100
1948	31,200	31,200	100
1949	56,200	100,000	56.2
1950	77,748	190,000	41.0
1951	129,639	210,000	61.6
1952	165,754	265,000	62.5
1953	220,814	325,000	68.0
1954	260,787	365,000	71.4
1955	347,869	535,000	65.0
1956	462,228	750,000	61.6
1957	496,184	870,000	57.0
1958 (estimated)	466,000	870,000	53.6

It will be noted from the above table that there has been a rapid increase in average daily production in each year up to and including 1957. Since 1954, however, there has been a steady decline in the average daily production rate expressed as a percentage of producing potential, from 71.4 per cent in 1954 to 57.0 per cent in 1957. A further decline in this rate to 53.6 per cent is anticipated in 1958, with an average daily production of an estimated 466,000 barrels per day.

The following table summarizes the disposition of crude oil production in Western Canada in the years 1956 and 1957 and the forecast disposition for 1958.

	Thousands of Barrels Per Day		
	1956	1957	Forecast 1958
Exports			
Puget Sound	52,600	74,200	40,000
Offshore (mainly California)	17,000	19,500	—
Mid-West United States	46,200	57,000	60,000
Total exports	115,800	150,700	100,000
Domestic	346,400	345,300	366,000
Total production	462,200	496,000	466,000

Export Markets

It will be noted from the above table that exports to the Puget Sound area increased from 52,600 barrels per day in 1956 to 74,200 barrels per day in 1957, and are expected to decline to 40,000 barrels per day in 1958.

Similarly the offshore export market (mainly California) increased slightly from 17,000 barrels per day in 1956 to 19,500 barrels per day in 1957. No offshore shipments are anticipated in 1958.

Exports to the mid-western United States increased from 46,200 barrels per day in 1956 to 57,000 barrels per day in 1957, and are expected to show a further increase to 60,000 barrels per day in 1958, reflecting a steady growth in demand for Canadian crude oil in this area.

To a considerable extent, the high level of export demand in the Puget Sound area and in the offshore market in 1956 and 1957 is attributable to the shortage of ocean tankers that developed during the latter part of 1956 and the first part of 1957 following the closing of the Suez Canal. This increase in export demand in these years was due to an emergency situation, and as a result, crude oil production was at a much higher level than could have been expected from normal growth in export markets.

By contrast, exports to the Puget Sound area in the first few months of 1958 have been at an abnormally low level and are expected to continue at a low level throughout the remainder of the year.

The decline in this export market reflects the levelling-off in demand for petroleum products in the United States which occurred in 1957 and is continu-

ing into 1958. To a considerable extent it is probably to be attributed to the fact that refiners are reducing crude runs and drawing on inventories to supply their current product requirements, in an effort to bring the excessive inventories that accumulated in 1957 into better balance with the current situation of over supply of products in the area.

The recent application of restrictions on imports of foreign crude oil into the U.S. Pacific Coast area has probably not as yet played a part in the decline of this export market, since the quotas that have been established for refiners in the Pacific Coast area exceed the volumes of foreign crude oil that they are importing at the present time.

Domestic Markets

It will also be noted from the preceding table that production of Canadian crude oil for domestic consumption in 1957 was at about the same level as in the previous year, reflecting a levelling-off in demand for petroleum products which also occurred in Canada in 1957.

For 1958, however, production of Canadian crude oil for domestic consumption is expected to increase by an average of about 20,000 barrels per day over 1957. In our opinion, the estimated production for domestic consumption in 1958 is abnormally depressed to the extent of something in the order of 36,000 barrels per day below the crude oil requirement necessary to supply anticipated demand for petroleum products in 1958, due to a reduction in refiners' inventories to a corresponding crude oil equivalent.

In 1959, we anticipate a marked improvement in production for domestic consumption with an increase of approximately 23 per cent, from 366,000 barrels per day in 1958 to 449,000 barrels per day in 1959.

That the level to which crude oil production in Western Canada has dropped in recent months is not indicative of the level of production that is to be expected for the entire year 1958 is, we believe, demonstrated in the following table:

	Last Quarter 1957	First Quarter 1958	Second Quarter 1958 (Estimated)	Last Quarter of 1957 and First Half of 1958	Estimated Production for Entire Year 1958
	(Barrels Per Day)				
Exports					
Puget Sound	62,900	41,800	32,000	45,600	40,000
Mid-west United States	57,300	67,300	60,000	61,500	60,000
Total exports	120,200	109,100	92,000	107,100	100,000
Domestic	315,800	360,800	338,000	338,200	366,000
Total production	436,000	469,900	430,000	445,300	466,000

It will be noted from the preceding table that production for the last quarter of 1957 and for the first half of 1958 (including estimated production for the second quarter of 1958) at 445,300 barrels per day is some 21,000 barrels per day below the estimated average daily production for the entire year 1958 of 466,000 barrels per day.

In particular, production for the second quarter of 1958, is some 36,000 barrels per day below the anticipated average daily production for the entire year.

To the extent of 8,000 barrels per day, this decline in the second quarter is attributable to a decline in production for export, but the major part of the decline, amounting to 28,000 barrels per day, is in production for domestic consumption.

This decline in production for domestic consumption, we believe, is attributable to a considerable extent to the fact that refiners will be drawing on inventories to supply their product requirements, particularly on excessive inventory accumulation of middle distillates during a comparatively mild winter. Refinery shut-downs for cleaning and reconditioning of units will also be a factor contributing to the low level of production anticipated in the second quarter of 1958.

POTENTIAL MARKETS FOR WESTERN CANADIAN CRUDE OIL

To find an answer to the question of how Canada's crude oil reserves should be utilized in the best interests of the Canadian economy as a whole, it is necessary, in our opinion, to examine the prospects for increased production over the longer term and from the standpoint of the Canadian refiner as well as the producer.

This section is concerned with examining the prospects for increased production which will come about through:

- (a) Increased demand in markets which, in whole or in part, are being supplied with Canadian crude oil at the present time, and
- (b) the entry of Canadian crude oil into new markets either directly or indirectly. In the latter case, this would occur through the entry of products refined from Canadian crude oil into areas now being supplied with products refined from foreign crude oils.

Domestic Crude Oil Requirements

Growth in the crude oil requirements of Canadian refineries will be determined in the first instance by growth in demand for petroleum products. This may be limited to some extent by the ability of Canadian refineries to balance product yields obtainable from the types and gravities of crude oils available, against product demands in the various major product categories — gasolines, middle distillates, residual fuel, and asphalt.

This problem will be further complicated by variations as between individual refiners in the proportions of their own sales of products in the various major product categories. For example, one refiner may have a higher proportion of gasoline sales to sales of middle distillate than another refiner. Each refiner, in order to balance his product yields as closely as possible against his own sales requirements, might require a different selection of crude oils from the selection which would best meet the combined product requirements of both.

Subject to the above limitations we believe that the growth in refinery crude oil requirements can be predicted with reasonable accuracy.

In estimating the extent to which Canadian crude oil might be utilized to meet projected future refinery crude oil requirements, one must consider, in addition to the physical limitations referred to above, the comparative economics of alternative sources of supply, in order to weigh the advantages that might

accrue from increased production of crude oil in Canada against the over-all cost to the Canadian economy of supplying its petroleum product requirements in this manner.

The methods used in arriving at our estimates of refinery crude oil requirements in the various areas considered in this section are outlined in Appendix A of this submission.

Two cases of domestic demand (described fully in Appendix B) are considered in this submission. In the first case the Montreal refining area is excluded from the potential domestic demand; in the second case, it is included.

CASE I

Case I is our best estimate of the potential domestic demand for Canadian crude oil in each of the years 1958 to 1967 inclusive, based on the following assumptions:

- (a) That Western Canada's refineries operate wholly on Canadian crude;
- (b) That the portion of the Ontario market in the Cornwall and Ottawa Valley areas will continue to be supplied with products refined in the Montreal area from imported foreign crude oils, although it is conceivable, that with a change in the distribution pattern for petroleum products anticipated by 1962, the requirements of this area could be economically supplied with products refined in the Sarnia-Toronto area from Canadian crude oil;
- (c) That in 1962 and subsequent years the Ontario market, excluding the Cornwall and Ottawa Valley areas, will be supplied with products refined in the Sarnia-Toronto area from Canadian crude oil, except for a limited volume of imported products required to balance refinery yields against market demands. Prior to 1962 a portion of this area will be supplied with products refined in Montreal from imported foreign crude oils and shipped into the area via Trans-Northern Pipe Line.

In our opinion, Case I is what is likely to take place in the way of expansion of the Ontario market for Western Canadian crude oil, in the light of existing and planned refinery and pipe line facilities in the area.

Case I is a continuation of the orderly eastward expansion of markets for Canadian crude oil that has been taking place over the last several years.

British American's own experience in increasing utilization of Canadian

crude oil at its Clarkson refinery in the Toronto area to supply its product requirements in Ontario is shown in the following table:

Percentage of Canadian Crude Oil Processed at Clarkson Refinery

~~(Thousands of Barrels per day)~~

1950	Nil	1955	56%
1951	12%	1956	67%
1952	13%	1957	78%
1953	47%	1958 (estimated)	89%
1954	55%	1959 (estimated)	100%

As will be seen from the above table, British American plans to utilize 100 per cent Canadian crude oil at Clarkson in 1959, providing a suitable asphalt-type crude oil can be obtained in sufficient volume from Western Canada.

The steady increase in utilization of Canadian crude oil at Clarkson up until 1957, as shown in the above table, was made possible by the construction of a \$4.5 million lake tanker, which was employed in transporting crude oil from Superior to Clarkson prior to the extension of the Interprovincial Pipe Line to Clarkson in 1957.

A major expansion of refining capacity at Clarkson from 20,000 barrels per day to 60,000 barrels per day, at a capital cost of approximately \$20 million, was completed in October, 1957, to coincide with the extension of Interprovincial's facilities to the Toronto area.

Immediately on completion of this expansion, British American increased its receipts of Canadian crude oil at Clarkson from 15,000 barrels per day to 34,000 barrels per day, with a corresponding reduction in crude runs at its Montreal refinery. With its increased capacity at Clarkson, British American is now in a position to utilize additional volumes of Canadian crude oil to supply the product requirements of the Ontario market, as soon as the reversal of existing product pipe line facilities east of Toronto would make it economically feasible to do so.

This would effect a further penetration of Canadian crude oil into the Montreal refining area through the displacement of products now being refined from imported crude oils in the Montreal area and shipped into Ontario by pipe line, with products refined in the Sarnia-Toronto area from Canadian crude oil.

CASE II

In Case II we have added to the potential domestic demand estimated in Case I the potential market for Canadian crude oil in the Montreal refining area.

The potential domestic markets for Canadian crude oil under Cases I and II for each of the years 1958 to 1967 inclusive are shown in Schedule II and graphically in Exhibit I.

It will be noted from Schedule II that potential domestic markets for Canadian crude oil under Case I (excluding the Montreal refining area) and Case II (including the Montreal refining area) would show the following increases over the next ten years:

	Potential Domestic Markets			
	1958	1962	1967	Percentage Increases 1967 over 1958
		(Thousands of Barrels per day)		
Case I	366	580	728	99%
Case II	366	785	989	170%

Potential Export Markets

A major factor in the future growth of markets for Canadian crude oil will be the development of export markets in the United States. The logical export markets in the United States are the Puget Sound refining area, already served by Trans Mountain Pipe Line, and the mid-western United States, supplied by Interprovincial Pipe Line.

While these two areas offer the greatest possibility for increased production of Canadian crude oil for export, there are other potential export markets in the United States into which Canadian crude oil is likely to penetrate in substantial volumes as the United States becomes increasingly dependent on foreign sources of crude oil. Chief among these other potential export markets are California on the West Coast, and the Chicago, Detroit and Toledo refining areas in the Great Lakes Region.

At the present time, it is difficult to assess accurately the potential market for Canadian crude oil in these areas. Reflecting the economic recession which became apparent early in 1957, domestic consumption of petroleum products in the United States in 1957 fell short of original expectations and showed virtually no increase over 1956. Industry forecasts for 1958 predict very little increase in demand.

By contrast, the average annual rate of growth in consumption of petroleum products in the United States over the last forty years has been in the order of 6 per cent per year. This average long-term growth rate of 6 per cent per year was maintained with remarkable consistency throughout the entire forty-year period. There does not appear to be any reason why it should not continue in the future despite short-term deviations from the long-term trend.

Coupled with this temporary levelling-off in consumption of petroleum products, a world-wide over-supply of crude oil has developed.

These two factors have led to the adoption of a program for voluntary restriction on imports of crude oil into the United States, and the establishment of quotas for various United States refining areas, which could materially affect the volumes of Canadian crude oil that might otherwise move into available export markets in the United States.

While these import restrictions continue, there will be a preference on the part of refiners in the United States to utilize as much crude as possible from those sources in which they will have a larger percentage of owned production, and to supplement their product requirements in areas accessible to Canadian crude oils in which they have a relatively small share of owned production, with products refined from crude oils from other sources.

Moreover, the continuation of these import restrictions might also result in the postponement of refinery construction planned in areas accessible to Canadian crude oils that might otherwise provide additional markets for Canadian crude oil.

For the near term, therefore, the outlook for export markets for Canadian crude oil in the United States is clouded with uncertainty. On the other hand, informed opinion on the subject indicates that over the next ten years the growth in consumption of petroleum products in the United States and the decline in producing potential will be such that the United States will become increasingly dependent on foreign sources of crude oil.

Over the long term, therefore, because of our favorable geographic location and strong competitive position, we are confident that there will be an increasing demand of significant proportions for Canadian crude oil in the United States.

Because of the present uncertainty with regard to export, we have considered three different levels of export demand for both Cases I and II.

With Level A, export demand is assumed to remain constant at 100,000 barrels per day throughout the forecast period. ✓

With Level B, it is assumed that export demand will increase from 100,000 barrels per day in 1958 to 180,000 barrels per day in 1967. ✓

With Level C, the assumption is an increase in export demand from 100,000 barrels per day in 1958 to 480,000 barrels per day in 1967. ✓

(See Appendix B).

In Schedule III we show for each of the years 1958 to 1967 inclusive, the total potential market for Canadian crude oil (domestic and export) at the three levels of export demand noted above, with the Montreal refining area excluded from the potential domestic market in all three cases. ✓

Similarly in Schedule IV, we show for each of the years 1958 to 1967 inclusive, the total potential market for Canadian crude oil (domestic and export) at the same three levels of export demand with the Montreal refining area included in the potential domestic market in all three cases. ✓

These projections in Schedules III and IV are shown graphically in Exhibit I and are summarized in the following table:

TOTAL POTENTIAL MARKET FOR CANADIAN CRUDE OIL
(Domestic and Export)

Excluding Montreal Refining Area	1958			1967			Percentage Increase
	Domestic	Export	Total	Domestic	Export	Total	
Case IA	366	100	466	728.3	100	828.3	78%
Case IB	366	100	466	728.3	180	908.3	95%
Case IC	366	100	466	728.3	480	1,208.3	159%
<u>Including Montreal</u>							
<u>Refining Area</u>							
Case IIA	366	100	466	989.7	100	1,089.7	134%
Case IIB	366	100	466	989.7	180	1,169.7	151%
Case IIC	366	100	466	989.7	480	1,469.7	215%

At all three levels of export demand it has been assumed that the export market in the mid-western United States will remain constant throughout the forecast period, at the level of demand of 60,000 barrels per day anticipated for 1958. This assumption is based on the fact that there have been no announced plans for new refineries in the area. ✓

As will be explained later in this submission, Canadian crude oil has a competitive advantage in the Superior and St. Paul-Minneapolis areas. While quota restrictions on imports may limit the volume of Canadian crude oil moving into this area in the immediate future, over the longer term there is every reason to expect a substantial growth in this export market in excess of the present level of demand of 60,000 barrels per day.

Referring again to the summary of the various cases considered in the above table, it will be seen that even in Case IB, with the Montreal refining area excluded from domestic demand and with export demand reaching only 180,000 barrels per day in 1967, Canadian crude oil production in 1967 will increase by 95 per cent over the level of production of 466,000 barrels per day anticipated for 1958.

Weighing all the factors, we believe that Case IB is a conservative projection, particularly with respect to export markets. We anticipate that the demand for production of Canadian crude oil in 1967 will be substantially in excess of the 908,000 barrels per day shown in Case IB and could well reach the level of 1,208,000 barrels per day shown in Case IC. ✓

In our opinion, therefore, the long term outlook for Canadian crude oil production is highly promising even without an additional market for Canadian crude oil in the Montreal refining area. /

As a major producer of crude oil in Western Canada, with approximately 8 per cent of total industry production, British American has a vital interest in the development of additional markets for Canadian crude oil. We therefore believe that every potential market for Canadian crude oil should be thoroughly explored and evaluated.

From the standpoint of the Canadian producer, the increased production that would result from an additional market outlet in the Montreal area would confer an obvious benefit, provided of course, that Canadian crude oil could enter this market without a substantial reduction in well-head price to the producer. This benefit to the producer from increased production would commence immediately upon completion of the necessary pipe line facilities to transport Western Canadian crude oil to Montreal. In our opinion, these facilities could not be completed and in operation until late 1960 at the earliest, and probably not until 1961. / X

On the other hand, the benefit to the Canadian producer from an additional major market outlet in Montreal as early as 1961 should be carefully weighed against possible disadvantages in committing a substantial volume of Canadian //

crude oil reserves to this market over the longer term, and against the over-all cost to the Canadian economy of supplying the Montreal market with Canadian crude oil as against imported crude oils.

This is essentially a question of the over-all economics of crude oil and product supply, which will be determined by two major factors:

1. The competitive position of Canadian crude oil in the Montreal area as against imported crude oils. In determining this competitive position, the capital cost of pipe line facilities to transport Canadian crude oil to Montreal and the resulting pipe line tariffs will be the major considerations.
2. The implications of a long-term commitment of Canadian crude oil to the Montreal market, which would be essential for the financing of a crude oil pipe line to Montreal, in view of the potential export markets which would be economically more favorable to the Canadian producer.

ECONOMICS OF ENTRY OF CANADIAN CRUDE OIL INTO POTENTIAL DOMESTIC AND EXPORT MARKETS

(1) Competitive Position of Canadian Crude Oil in Potential Domestic and Export Markets

In evaluating the potential market for Canadian crude oil in the Montreal refining area, the first major factor to be considered is the competitive position of Canadian crude oil as against crude oil from other sources of supply, not only in the Montreal market itself, but also in possible alternative export markets that would provide an economically more favorable outlet for Canadian production.

As previously noted, the major export markets for Canadian crude oil are in the Puget Sound refining area of the Pacific Northwest and the St. Paul-Minneapolis area of the mid-western United States.

Puget Sound Area

From the standpoint of laid-down cost, Canadian crude oil is in a very strong competitive position in this area as against other crude oils. By reason of the relatively close proximity of Canadian crude to the area and established pipe line connections, the transportation cost component of its total laid-down cost is considerably less than in the case of crude oils from offshore sources of supply. This is shown in the following table:

<u>Crude Source</u>	<u>Transportation and Miscellaneous Cost Component</u>	<u>Total Laid-Down Cost</u>	<u>Redwater laid-down cost is:</u>
Redwater (35°)	\$0.55	\$3.29	\$ —
Sumatra (34°)	1.05	3.27	0.02 Higher
Kuwait (31°)	1.46	3.31	0.02 Lower
Arabia (34°)	1.41	3.49	0.20 Lower
Venezuela (34°)	0.75	3.77	0.48 Lower
California (35°)	0.24	3.85	0.56 Lower

The method of calculation of the costs shown in the above table is explained in Appendix C to this submission.

It will be seen from the above table that, from the standpoint of laid-down cost, Canadian crude oil at the present time is competitive in the Puget Sound area with Sumatra and Kuwait crude oils, and has a very definite competitive advantage over crude oils from other sources of supply, ranging from 20 cents over Arabian crude oil up to 48 cents over Venezuelan crude oil and 56 cents over Californian crude oil.

As the share of Canadian crude oil in this market increases, the increasing volume of pipe line throughput would tend to reduce transportation cost per barrel, and this would further improve the competitive position of Canadian crude oil in this area.

St. Paul-Minneapolis Area

Again, by reason of its relative proximity and established pipe line connections, Canadian crude oil is in a strong competitive position in the St. Paul-Minneapolis area of the mid-western United States.

The major portion of the product demand in this area is supplied by products shipped there by pipe line from refining centres to the east and south. Even in the face of this competition from pipe line products, Canadian crude oil has established itself in this market. The largest refinery in the area was constructed expressly to take advantage of the accessibility and price advantage of using Canadian crude oil.

Moreover, because of the remoteness of the St. Paul-Minneapolis area from tidewater sources of supply, the competitive position of Canadian crude is reasonably assured.

Montreal Refining Area

In the table set out below, we have made a comparison of the present laid-down cost in the Montreal refining area of various imported crude oils with our own estimate of the cost of laying down Redwater crude oil of 35° gravity by pipe line from Edmonton to Montreal.

Redwater crude oil of 35° gravity has been selected for this comparison as being representative of the type and gravity of Canadian crude oils that would be available for the Montreal market, on the basis of the types and gravities of crude oils that have been discovered in Western Canada to date, and on the basis of the probable disposition of available Canadian crude oils and product yield structures.

In this connection it is pointed out that the main pipe line streams available in Eastern Canada at the present time are Redwater at about 35° gravity and a blended crude stream of 36° to 37° gravity which is priced approximately the same as Redwater.

In this table, a comparison is made with the laid-down cost of imported crude oils of the types and gravities that are being brought into Montreal at the present time. In 1957, the Montreal-Portland Pipe Line delivered an

average of about 224,000 barrels per day of imported crude oil into Montreal. Of these deliveries, approximately 84 per cent was Venezuelan crude oil with the balance accounted for by crude oils from Trinidad, the United States, Arabia, Kuwait, Iran and Iraq. The average gravity of Venezuelan crude oil deliveries by Montreal-Portland Pipe Line in 1957 was about 31°.

Accordingly, for this comparison, we have selected Mesa crude oil of 31° gravity as a typical Venezuelan crude oil of the type and gravity of the crude oils imported into the Montreal refining area at the present time.

We have also shown in the table the laid-down cost of Kuwait crude, which is being imported at the present time in substantial quantities.

For purposes of comparison, it has been assumed that Canadian and United States funds are at par of exchange and the price of Redwater crude oil has been adjusted to par of exchange. The laid-down costs shown in the table are therefore the costs that would be incurred by the refiners in Montreal with Canadian and United States funds at par of exchange. Transportation charges from Edmonton to Montreal are based on a pipe line tariff of 75 cents per barrel, plus allowance for line loss of approximately 3 cents.

The last column of the table shows the competitive disadvantage in laid-down cost of Redwater crude oil.

<u>Crude Source</u>	<u>Transportation and Miscellaneous Cost Component</u>	<u>Total Laid-Down Cost</u>	<u>Redwater Laid-Down Cost is:</u>
Redwater (35°)	\$0.78	\$3.50	\$ —
Kuwait (31°)	1.20	3.05	0.45 Higher
Arabian (34°)	1.15	3.23	0.27 Higher
Venezuelan—Mesa (31°)	0.38	3.24	0.26 Higher

The estimated transportation charge included in the laid-down cost of Redwater crude oil in the above table is based on an estimated throughput to Montreal of 240,000 barrels per day, equivalent to our forecast of the crude oil requirement of the Montreal refining area in 1961.

The basis of calculation of this transportation charge is explained in Appendix D to this submission. The crude oil requirement of the Montreal refining area, as noted previously, is expected to drop to 205,000 barrels per day in 1962, with the reversal of Trans-Northern Pipe Line in that year, and not exceed 240,000 barrels per day again until 1966. We feel, therefore, that our estimated pipe line tariff of 75 cents per barrel can be considered as a realistic cost of transporting Canadian crude oil from Edmonton to Montreal.

It is recognized that in gravity and other characteristics, mainly sulphur content, that Redwater and Kuwait are not comparable crude oils. It is nevertheless a fact that certain refiners in the Montreal area have installed the necessary refining facilities to enable them to utilize Kuwait and other low-cost foreign crude oils in their refining operations. The differential of 45 cents per barrel shown in the above table in favor of Kuwait crude oil represents a real penalty that would be incurred by these refiners in operating on Canadian crude oils instead of Kuwait.

It is recognized also that Venezuelan crude oil of a comparable gravity to Redwater 35° API would lay down at a higher cost than the cost of Mesa 31° API shown in the table by approximately 17 cents per barrel. We do not believe, however, that this would be a realistic comparison, as the preference of refiners in the Montreal area for lower gravity crude oils to balance product yields against market demands is established by the gravities of the crude oils that they have in fact been importing into the area.

The differentials of 26 cents per barrel in favor of Mesa 31° API and of 45 cents per barrel in favor of Kuwait crude oil are, we believe, a realistic indication of the additional costs that would be incurred by refiners in the Montreal area in switching to Canadian crude oils.

In projecting the crude oil requirements of the Montreal refining area on a total industry basis, no cognizance is taken of the fact that the crude oil requirements of individual refiners in the area will vary considerably from the total requirement projected on an industry basis, because of variations as between individual refiners in the proportion of their sales in various major product categories.

Another important factor which has not been taken into account in our projection of the potential market for Canadian crude oil in the Montreal refining area is that specialty crude oils now being imported into Montreal for the manufacture of naphthenic lubricating oils and asphalt may not be available from Western Canada. The necessity of continuing to import specialty crude oils for this purpose would reduce the potential market for Canadian crude oil in the Montreal area shown in our projection possibly by as much as 25,000 barrels per day.

Because of the comparatively high ratio of demand for middle distillates to gasoline demand in Quebec, refiners in the Montreal area, operating on higher gravity Canadian crude oils to meet gasoline demands, would produce a smaller percentage of the total middle distillate and residual demand than would be the case if they were operating on available lower gravity foreign crude oils.

This would result in an over-all reduction in total crude run at refineries in the area, and an increase in the volume of refined products that would have to be imported into the area to balance refinery yields of products against market demands.

This is shown in Schedules VI to IX inclusive, and is summarized in the following table for the years 1962 and 1967:

	Imports Required to Balance Refinery Yields		
	Total Crude Run	Middle Distillate (Thousands of Barrels Per Day)	Total Imports Required
1962			
Operating on available Canadian crude oils	204.9	37.0	44.5
Operating on available foreign crude oils	222.6	24.7	40.7
1967			
Operating on available Canadian crude oils	261.4	54.7	50.9
Operating on available foreign crude oils	283.8	39.0	46.1

The competitive disadvantage of Canadian crude oils in the Montreal market previously indicated in this section is based on conditions as they exist today. It is quite conceivable that Canadian crude oil would be at a still greater competitive disadvantage in the future as the cost of ocean tanker transportation would tend to be reduced with the increased employment of larger tankers.

A final point to be considered is that the higher cost of Canadian crude oils in the Montreal refining area would increase the cost of products refined in the area, as against the cost of products refined from imported crude oils in the Maritime Provinces. This would tend to extend the product supply area of refineries in the Maritime Provinces at the expense of refineries in the Montreal area, and to increase crude runs of imported crude oils in the Maritime refineries at the expense of the Montreal refineries.

Taking all these factors into account, we are firmly of the opinion, that the cost of crude oil to supply the product requirements in the economic supply area of the Montreal refineries (that is, Quebec including the Cornwall and Ottawa Valley area in Ontario) would be increased by something in the order of 26 cents to 45 cents per barrel if the Montreal refineries were operated on Canadian crude oils instead of foreign crude oils, unless there were a corresponding reduction in the well-head price of Canadian crude oils.

In our opinion, as a major producer in Western Canada, the industry could not absorb a price reduction of this magnitude and obtain any sort of a reasonable rate of return on the investment required to find and develop the reserves needed to supply this market.

(2) Implications of Committing Canadian Crude Oil Reserves to the Montreal Market

In order to finance the construction of pipe line facilities to transport Western Canadian crude oil to the Montreal market it would be necessary to have throughput guarantees from refiners in Montreal, which would effectively commit a substantial portion of Canadian crude oil reserves to this market for an extended period. In this sub-section, we propose to consider the implications of such a commitment, in the light of the prospects of growth in export markets that would be economically more favorable to the Canadian producer by virtue of the competitive advantage that Canadian crude oil would enjoy in these markets.

In Appendix E we have projected the reserves required for each of the various cases of total crude oil demand (domestic and export) considered earlier in this submission. We have also projected the exploration programs necessary to support these required reserves, production in each year of the forecast period 1958 to 1967 inclusive, and production in each year as a percentage of the producing potential.

These projections are shown graphically for each of the various levels of total demand in Exhibits II, III and IV, and are summarized for the years 1958, 1962 and 1967 in Schedule X.

We have previously stated our opinion that the projected demand for Canadian crude oil in Case IB (excluding the Montreal refining area and with export demand increasing to only 180,000 barrels per day by 1967) is a conservative projection.

It will be noted from Schedule X that under Case IB, with exploration activity maintained at 1,000 exploratory tests per year and with an average discovery rate of 400 million barrels of new reserves per year throughout the forecast period, the industry would reach 68 per cent of producing potential by 1962, and 78 per cent by 1967.

Should demand increase as in Case IC (again excluding the Montreal market but with export demand increasing to 480,000 barrels per day by 1967), the industry would reach 85 per cent of producing potential in 1962 and 100 per cent in 1965. In order to maintain a reserves-to-production ratio of 10 to 1, explora-

tion activity would have to be stepped up to 1,800 exploratory tests per year by 1967, and 4.7 billion barrels of new reserves would have to be found in the forecast period as compared with 3.8 billion barrels of reserves found in Western Canada to the end of 1957.

We feel that the growth in export markets for Canadian crude oil will probably fall somewhere between the B and C levels.

In this event, even without the Montreal market, and with an exploration activity of 1,000 exploratory test wells per year, we expect that industry production will reach something between 714,000 and 850,000 barrels per day (between 68 per cent and 85 per cent of producing potential) by 1962.

By 1967, we expect that industry production will reach something between 908,000 and 1,208,000 barrels per day (between 78 per cent and 100 per cent of producing potential).

Pipe line facilities to transport Canadian crude oil to Montreal are not likely to be completed and in operation before 1961. Even without the Montreal market, we expect industry production to exceed 68 per cent of producing potential by 1962, and an exploration program of something in the order of 1,000 exploratory test wells per year will be necessary to support this anticipated growth in demand.

We, therefore, can see no reason to anticipate any decline in exploration activity in Western Canada over the longer term from the level of 1,000 exploratory test wells per year reached in 1957.

For the shorter term, any temporary decline in exploration activity due to insufficient revenue from production to finance further exploration will be largely corrected by 1962 even without this additional market which could not be served by a pipe line before 1961 at the earliest.

As noted in Appendix D, the capital cost of the pipe line facilities required to transport Canadian crude oil to Montreal is estimated in the order of \$291 million, or \$206 million more than the estimated cost of \$85 million to expand Interprovincial's facilities to supply the increasing requirements of the Sarnia and Toronto refining areas only. We believe there is a good prospect of a reasonable increase in export demand within the period of our forecast. The industry would, in our opinion, be ill-advised to undertake a capital expenditure of this magnitude to gain entry for Canadian crude oil in a market where it would be at a competitive disadvantage with imported foreign crude oils.

The capital requirements facing the petroleum industry for exploration and development activity in the next ten years, as indicated in our earlier submission to the Royal Commission on Energy in February, 1958, were estimated to be in the order of \$7.4 billion.

It is clear from Schedule X that at all three levels of export demand, a marked increase in exploration activity would be necessary within the forecast period to find the additional reserves required to support the total demand under Case II with the Montreal market included in domestic demand.

If the industry were required to meet the capital requirements for exploration and development work necessary to furnish crude oil to refineries in the Montreal area, we estimate that the capital needs of the industry would approach \$10 billion over the next ten years.

If it were necessary for Canadian crude oil, in order to gain entry to the Montreal market, to take a reduction in well-head price to equalize its laid-down cost at Montreal with that of imported crude oils, there would not, as previously stated, be an adequate incentive to the industry in the way of a reasonable return on the investment to find and develop the new reserves that would be required to supply this additional market.

To the extent that the competitive advantage of imported foreign crude oils in this market were reduced by import quotas or tariffs, the refining segment of the petroleum industry and the Canadian economy in general would be saddled with an additional burden of cost in supplying the petroleum product requirements of the area served by refineries in Montreal.

CONCLUSIONS AND RECOMMENDATION

1. Estimated Increase in Domestic Demand for Canadian Crude Oil

Growth in domestic demand for Canadian crude oil will show the following increases over the next ten years:

	1958	1962	1967	Percentage Increase 1967 over 1958
	(Thousands of Barrels Per Day)			
Case I (excluding Montreal)	366	580	728	99%
Case II (including Montreal)	366	785	989	170%

Both these cases of domestic demand anticipate an expansion of the market for Canadian crude oil in the Toronto refining area, resulting in a further penetration of the Montreal market through the displacement of products refined in Montreal from imported crude oils with products refined in the Toronto area from Canadian crude oils.

2. Estimated Increase in Total Demand (Domestic and Export) for Canadian Crude Oil

In our opinion, total demand for Canadian crude oil, both domestic and export and with the Montreal refining area excluded from domestic demand, is likely to fall somewhere between Case IB and Case IC shown in the following table:

	1958	1962	1967	Percentage Increase 1967 over 1958
Excluding Montreal Market				
	(Thousands of Barrels Per Day)			
Case IB	466	714	908	95%
Case IC	466	850	1,208	159%

3. Potential Market for Canadian Crude Oil in Montreal Refining Area

We estimate that the potential market for Canadian crude oil in the Montreal refining area would not exceed 240,000 barrels per day in 1961, would decline to 205,000 barrels per day in 1962, increasing gradually in each year thereafter to 261,000 barrels per day in 1967.

4. Competitive Position of Canadian Crude Oil in Montreal Market and Potential Export Markets

Canadian crude oil is in an excellent competitive position in the major export markets of the Puget Sound and St. Paul-Minneapolis refining areas of the United States.

It is at a competitive disadvantage as against imported crude oils in the Montreal refining area.

5. Implications of Committing Canadian Crude Oil Reserves to Montreal Refining Area

(a) Exploration Activity in Western Canada

Even without the Montreal market, industry production of crude oil in Western Canada is expected to exceed 68 per cent of producing potential by 1962. A program in the order of 1,000 exploratory test wells per year, or approximately the level of activity reached in 1957, will be required to support this anticipated growth in demand.

With the Montreal market included in domestic demand, a very marked increase in exploration activity would be necessary to find the additional reserves required to support this additional demand.

If it were necessary for Canadian crude oil, in order to gain entry to the Montreal market, to meet the competition of imported crude oils, there would not, in our opinion, be an adequate incentive to the industry in the way of a reasonable return on investment to find and develop the new reserves required to supply this additional market.

(b) Capital Undertaking

With the increase in export demand that we feel is likely to take place within the period of our forecast, the industry would, in our opinion, be ill-advised to undertake a capital expenditure of \$206 million for pipe line facilities, plus \$2.6 billion to find and develop the necessary reserves to gain entry for Canadian crude oil into the Montreal market, where it would be at a competitive disadvantage with imported crude oils.


(c) Effect of Quotas and Tariffs

To the extent that the competitive advantage of imported crude oils in the Montreal refining area were reduced by import quotas or tariffs, the Canadian economy in general would be saddled with a burden of additional cost for petroleum products.

6. Recommendation

With the prospect of an expanding market for Canadian crude oil in the United States over the longer term, and viewing the problem from the standpoint of the Canadian refiner as well as that of the Canadian producer, the entry of Canadian crude oil into the Montreal refining area would not be in the best interests of the petroleum industry in Canada or of the Canadian economy in general.

Accordingly, it is our recommendation for the utilization of Canada's reserves of crude oil in the manner that will best serve the interest of the Canadian economy as a whole, and of all segments of the petroleum industry in Canada:

- (a) That every effort should be made by refiners in areas served by existing pipe line facilities, to utilize Canadian crude oil to the greatest extent that is economically feasible and to enlarge the markets supplied from refinery areas served by existing pipe line facilities.
 - (b) That every effort should be made by the Canadian Government through representations at the highest level to the Government of the United States, to secure a reciprocal arrangement which would permit the unrestricted flow of crude oil and natural gas between Canada and the United States, to the mutual advantage of both countries.
- 

APPENDIX A

CRUDE OIL REQUIREMENTS

As previously noted, growth in the crude oil requirement of Canadian refineries will be determined in the first instance by growth in demand for petroleum products, but may be limited to some extent by the ability of Canadian refineries to balance product yields obtainable from the types and gravities of crude oils available, against product demands in the various major product categories — gasolines, middle distillates, residual fuel and asphalt.

Future Demand for Petroleum Products

In general our procedure in estimating future demand for petroleum products was to estimate the demand in 1967, the last year of the forecast period, and from the total increase in demand over the entire period, to calculate the average annual rate of increase in demand. This was then applied to our estimate of demand for 1957 as the base year, to arrive at the estimated volumes for individual years of the forecast period.

The volumes estimated for individual years of the forecast period, therefore, represent a general trend of growth in demand over the entire period. They do not take into account annual fluctuations in demand above or below the general trend.

It follows, therefore, that the actual volume of demand in individual years of the forecast period could, and undoubtedly will, vary from the volumes estimated for each year on the basis of the predicted general trend, but the general trend for the entire period would be still realized.

In estimating demands in 1967, we first made projections of population growth and Gross National Product. From these projections were derived such secondary demand factors as personal disposable income, useful in estimating motor vehicle registrations on which our estimates of gasoline demand were based; and household formations, useful in estimating consumption of fuel oils for heating, which account for roughly 60 per cent of total consumption of products in the middle distillate category.

In general, we believe that our estimates of motor gasoline consumption are well supported by statistical data and will prove to be fairly accurate over the long term. Our estimates of middle distillate consumption are subject to a greater possible margin of error for two reasons:

1. The limited amount of statistical data available on the end-use of products in the middle distillate category.

2. The difficulty of accurately assessing, at this time, the impact of natural gas on the heating fuel market in those areas into which natural gas from Western Canada has recently made, or will in the near future be making its first entry.

If anything, we believe that our estimates of demand for middle distillates may be somewhat on the high side. As will be explained later, however, this would not materially affect our estimates of crude oil requirements of Canadian refineries since it has been assumed that, in general, the refineries will be operated to meet gasoline demands with maximum yield of middle distillates.

Because of the comparatively low ratio of gasoline demand to demand for middle distillates in British Columbia, and in Eastern Canada, it is not possible for refineries in these areas to balance the product yields obtainable from available Canadian crude oils against product demands, and to produce the volumes of middle distillates required without producing surplus volumes of gasoline in excess of indicated demands.

Accordingly, in operating to meet gasoline demands, the yield of middle distillates obtainable from available crude oils falls short of indicated demands and it is necessary for the industry as a whole to import middle distillates to make up these deficiencies.

To the extent that our estimates of middle distillate demand may be high, required imports of middle distillates would tend to be reduced, but refinery crude oil requirements would not be materially affected.

Refinery Crude Oil Requirements

In estimating the crude oil required to supply the Ontario and Quebec markets, an analysis of the gravity of available crude oils was made to calculate the percentage yields of products in the various product categories that could be obtained from these crude oils. From these percentage yields, the volume of products in each of the major product categories that could be manufactured from available crude oils was calculated. This calculation having been made, the volume of imported products required to balance refinery yields against market demands was determined.

Schedule II is a summary of the crude oil requirements to meet the forecast domestic demand for petroleum products in each of the geographical areas shown based on the calculated yield structures. Gasoline demands have been met in all areas. Demands for other products have been met to the extent that it is possible to do so from available Canadian crude oils under the calculated yield structures.

The crude oil requirement and hence the potential market for Canadian crude oil shown in Schedule II represents the crude oil equivalent of the estimated product demand in each area.

In the case of British Columbia, Ontario and Quebec, refinery supply areas approximate very closely the product demand areas shown. For all practical purposes, therefore, the crude oil equivalent of forecast product demands in these areas may be taken as the crude oil requirement of refineries located in these areas.

This is also true of the Prairie Provinces in total. For Alberta, Saskatchewan and Manitoba individually, some variation may be expected from the volumes shown for each province in Schedule II and the crude oil requirement of refineries located in each province, because of shipments of products to another province.


The extent to which Canadian crude oil might be utilized to supply these indicated crude oil requirements will depend on the following factors:

1. Main trunk pipe line facilities to transport crude oil to refinery centres.
2. Adequate refinery capacity to process the forecast crude oil requirement of the various geographical areas.
3. Adequate facilities for the economic distribution of refined petroleum products from refineries to marketing supply points.

In British Columbia and the three Prairie Provinces there are no limitations of this nature, which would restrict full utilization of Canadian crude oil to meet the forecast requirements of these geographical areas, on the assumption, of course, that present refining and pipe line facilities will be expanded as and when required to meet indicated growth in demand.

In Ontario and Quebec, however, there are at the present time certain physical limitations of pipe line and refinery capacity, which would restrict utilization of Canadian crude oil in supplying product demands in these geographical areas.

Ontario

On completion of its current expansion program in September, 1958, Inter-provincial Pipe Line will have sufficient capacity to deliver 257,000 barrels per day as far as Sarnia, of which 109,000 barrels per day could be transported into Toronto. 

At the end of 1957 total refinery capacity in the Sarnia and Toronto areas was approximately 200,000 barrels per calendar day. This will be augmented by

an additional 20,000 barrels per day late in 1958 on completion of a new refinery now under construction in the Toronto area, and other plans for expansion of refinery capacity in this area have been announced.

Quebec

The entry of Canadian crude oil into the Montreal refining area is, of course, dependent on the construction of main trunk pipe line facilities to transport crude oil from Western Canada to Montreal. In our opinion, the required pipe line facilities to serve this market could not be completed and in operation until late in 1960 at the earliest and probably not until 1961.

In our projection of potential markets for Canadian crude oil in the Montreal area, we have assumed, however, that it would be possible for Canadian crude oil to enter the Montreal area at the beginning of 1960.

Our projection of potential markets for Canadian crude oil takes into account these physical limitations on utilization of Canadian crude oil in the earlier years of the forecast period.

In particular, with respect to the crude oil requirements shown in Schedule II for Ontario and Quebec, the following points are noted:

1958

The total Canadian crude oil requirement for Ontario (excluding the Cornwall and Ottawa Valley areas) of 159,000 barrels per day in 1958 is based on information obtained from various sources and approximates very closely a forecast for industry published by the Dominion Bureau of Statistics. As shown in Schedule V, we believe that this requirement has been reduced to the extent of something in the order of 17,000 barrels per day, due to the fact that refineries in the area are drawing on inventories to this extent to supply the 1958 product demands in the area.

1959

The increase in crude oil requirement of 52,000 barrels per day in 1959 over 1958, bringing the potential market in Ontario to 211,900 barrels per day in 1959, assumes that all refineries in Ontario will be operating on Canadian crude oil in 1959. In addition to the increase from anticipated growth in demand for petroleum products in the area, this potential market of 211,900 barrels per day reflects an additional crude run of 17,500 barrels per day at a new refinery under construction in the Toronto area at the present time and scheduled to come on stream late in 1958. It also assumes that the volume of foreign crude oil imported into Ontario will be reduced from 21,000 barrels per day in 1958 to 6,000 barrels per day in 1959.

1960

The further increase in crude oil requirement of approximately 20,000 barrels per day shown for Ontario in 1960 reflects a further anticipated growth in demand for petroleum products in the area, and the complete elimination of imported crude oils.

The potential market of 228,900 barrels per day shown for the Montreal refining area in 1960 assumes that pipe line facilities to transport Western Canadian crude oil to Montreal could be constructed and in operation by the beginning of 1960. Included in this total requirement of 228,900 barrels per day is a requirement of some 75,000 barrels per day to supply, out of Montreal, product demands in the Cornwall and Ottawa Valley areas, with an estimated crude oil equivalent of 30,000 barrels per day, and a portion of the product demand west of Cornwall and into the Toronto area, to the extent of a crude oil equivalent of approximately 45,000 barrels per day.

1961

The increases in crude oil requirements shown for both Ontario and Quebec reflect anticipated growth in demand for petroleum products in these areas. The requirement of 239,800 barrels per day shown for Montreal again includes some 75,000 barrels per day to supply a portion of the demand in Ontario.

1962

It is anticipated there will be a major addition to refinery capacity in the Toronto area coming on stream at the beginning of 1962. As a result, it is expected that the Trans-Northern Products Pipe Line will be reversed as from the first of the year for the shipment of products out of the Toronto refining area in an easterly direction as far as Farran's Point, the junction of Trans-Northern's spur line to Ottawa.

This would virtually eliminate any further shipment of products from the Montreal refining area into Ontario west of Farran's Point. Taking into account anticipated growth in demand, Ontario's crude oil requirement would increase by about 60,500 barrels per day, from 247,800 barrels per day in 1961 to 308,300 barrels per day in 1962.

On the other hand, the crude oil requirement of the Montreal refining area would be reduced from 239,800 barrels per day in 1961 to 204,900 barrels per day in 1962, as a result of this change in the distribution pattern. Included in this 204,900 barrels per day for the Montreal area would still be a crude oil requirement of 30,000 barrels per day to supply product demands in the Cornwall and Ottawa Valley areas out of Montreal.

It is quite conceivable that, with the reversal of Trans-Northern Pipe Line at the beginning of 1962, a considerable portion of this demand in the Cornwall and Ottawa Valley areas could be economically supplied with products refined in the Toronto area from Canadian crude oil. To the extent of any such displacement the potential market for Canadian crude oil in Ontario as shown in Schedule II would be increased and the potential market 204,900 barrels per day shown for Quebec correspondingly reduced.

1963 - 1967

The potential markets for Canadian crude oil in Ontario and Quebec for the remainder of the forecast period (1963 to 1967 inclusive) reflect the anticipated growth in demand for petroleum products in these areas in these years.

It will be noted that the potential market in Ontario increases from 308,300 barrels per day in 1962 to 396,200 barrels per day in 1967, and the potential market in Quebec from 204,900 barrels per day in 1962 to 261,400 barrels per day in 1967.

Summary

With the development that is anticipated in Ontario in the next few years, the potential market for Canadian crude oil in the Montreal refining area will not exceed 240,000 barrels per day in 1961, declining to 204,900 barrels per day in 1962, and increasing gradually in each year thereafter to 261,400 barrels per day in 1967.

In order to supply the crude oil requirements of the Montreal refining area in 1961, the pipe line capacity of Interprovincial would have to be expanded to permit a minimum delivery of 484,000 barrels per day as far as Sarnia, of which approximately 158,000 barrels per day would be taken off at Sarnia. The remaining 326,000 barrels would proceed to the Toronto refining area where some 86,000 barrels per day would be taken off, and the balance of 240,000 barrels per day would be delivered to Montreal.

In Schedules V to IX inclusive we show our estimate of crude oil demand and product supply for all Canada excluding the Atlantic Provinces for the years 1958, 1962 and 1967.

1958

For the year 1958 we have shown in Schedule V, the crude oil requirement for Quebec (including the Ottawa Valley) as being supplied from foreign crude oils imported into Montreal. Refined product demands for 1958, on which estimated crude oil requirements in this year are based, are our best estimate of

demand in the light of the statistics on consumption of petroleum products in Canada in 1957 recently published by the Dominion Bureau of Statistics, and in the light of the temporary levelling-off in demand in the current economic recession.

1962

For 1962, we have shown in Schedule VI the crude oil requirements of Quebec (including the Ottawa Valley) as being met from imported crude oils refined in Montreal.

In Schedule VII we have shown the crude oil requirements of this area supplied from Canadian crude oil refined at Montreal.

1967

Similarly for 1967, we have shown the crude oil requirements of Quebec including the Ottawa Valley being met with imported crude oils (Schedule VIII) and with Canadian crude oils (Schedule IX).

As will be seen from Schedules VI to IX and as summarized in the table below, in operating on higher gravity Canadian crude oils to meet gasoline demands, refiners in the Montreal area would produce a smaller percentage of the total middle distillate and residual demands than would be the case if they were operating on available lower gravity foreign crude oils. This would result in an over-all reduction in total crude run at refineries in the area, and an increase in the level of refined products that would have to be imported into the area to balance refinery yields of products against market demands.

	Total Crude Run	Required Imports to Balance Refinery Yields		Total Imports Required
		Middle Distillate (Thousands of Barrels	Residual Per Day)	
1962				
Operating on available Canadian crude oils	204.9	37.0	44.5	81.5
Operating on available foreign crude oils	222.6	24.7	40.7	65.4
1967				
Operating on available Canadian crude oils	261.4	54.7	50.9	105.6
Operating on available foreign crude oils	283.8	39.0	46.1	85.1

APPENDIX B**THE TWO CASES OF DOMESTIC DEMAND
FOR CANADIAN CRUDE OIL****Case I**

In Case I the potential domestic demand for Canadian crude oil from 1958 to 1967 inclusive is based on the following assumptions:

- (1) Refineries in British Columbia, Alberta, Saskatchewan and Manitoba will operate exclusively on Canadian crude oil throughout the entire forecast period.
- (2) The portion of the Ontario market in the Cornwall and Ottawa Valley areas will continue to be supplied with products refined in the Montreal area from imported crude oils.

The close proximity of the Cornwall and Ottawa Valley areas to Montreal, coupled with the fact that the product pipe line facilities of Trans-Northern are already supplying these areas, make it appear logical that Montreal would continue as their source of supply.

It is conceivable, however, that the competitive position of Canadian crude oil in the Toronto area might be such that, with the reversal of Trans-Northern Pipe Line anticipated in 1962, it could be economical to supply this area with products refined in the Toronto area from Canadian crude oil.

- (3) In 1962 and subsequent years the Ontario market, excluding the Cornwall and Ottawa Valley areas, will be supplied with products refined in the Sarnia and Toronto areas from Canadian crude oil, except for a limited volume of imported products required to balance refinery yields against market demands.
- (4) Prior to 1962 a portion of the product demand in Ontario west of Cornwall, to the extent of a crude oil equivalent of approximately 45,000 barrels per day, will be supplied out of the Montreal refinery area via Trans-Northern Pipe Line.

In 1958 and 1959, a limited volume of imported crude oil will be run at refineries in this area, and a limited volume of imported products required to balance refinery yields against market demands, will continue to enter the area in the years 1958 to 1961 inclusive.

Case II

In Case II we have added to the domestic market estimated in Case I the

potential market for Canadian crude oil in the Montreal refining area. Case II is based on the following assumptions:

- (1) That, to the extent that it is possible to do so, Canadian crude oil will be utilized to supply the forecast product demands of the province of Quebec and of the Cornwall and Ottawa Valley areas in Ontario.
- (2) That any movement of product from the Montreal refining area into the Atlantic provinces will be offset by product movements into Quebec from refineries now in operation or under construction in the Atlantic provinces.

Levels of Export:

Because of the uncertainty of export markets in the United States at the present time, three levels of export demand are considered.

Level A

In Level A, applied to both Case I and Case II in Schedules III and IV, it is assumed that export demand will remain constant at 100,000 barrels per day throughout the period of the forecast. This is the estimated level of export demand for 1958, of which 60,000 barrels per day is expected to move into the mid-western United States and 40,000 barrels per day into the Puget Sound area.

In assuming that total export demand will remain constant at only 100,000 barrels per day over the next ten years, we believe that we are considering the minimum level to which export demand is likely to drop over the period.

Level B

In Level B, as applied to both Case I and Case II, it is assumed that export demand will increase from 100,000 barrels per day in 1958 to 180,000 barrels per day in 1967. This assumption contemplates that demand in the mid-western United States will remain constant at 60,000 barrels per day throughout the forecast period, but that demand in the Puget Sound area will increase on a straight line projection from 40,000 barrels per day in 1958 to 120,000 barrels per day in 1967.

This latter figure of 120,000 barrels per day represents the total average daily capacity of refineries in the Puget Sound area in operation or under construction at the present time. It does not consider the possibility that other new refineries may be built in the area which will provide an additional market for Canadian crude oil.

Level C

In Level C, as applied to Case I and Case II, it is assumed that export demand will increase from 100,000 barrels per day in 1958 to 480,000 barrels

per day in 1967. This assumption contemplates that export demand in the mid-western United States will remain constant at 60,000 barrels per day, but that demand in the West Coast area will increase on a straight line projection from 40,000 barrels per day in 1958 to 420,000 barrels per day in 1967.

This latter figure of 420,000 barrels per day is the estimated demand for Canadian crude oil in the West Coast of the United States in 1966 in a study published in May, 1957, by the Petroleum Department of The Chase Manhattan Bank, entitled "Future Growth of the West Coast Petroleum Industry".

It represents a more optimistic view of potential export markets for Canadian crude oil and possibly the upper limit of potential export demand, as compared with the minimum level assumed in the A cases and an intermediate level assumed in the B cases.

APPENDIX C**COMPETITIVE LAID-DOWN COST OF CANADIAN AND
FOREIGN CRUDE OILS IN THE MONTREAL REFINING
AREA AND IN POTENTIAL EXPORT MARKETS
IN THE UNITED STATES**

Exhibit 5 to this submission is a map which shows the competitive laid-down cost of Canadian and foreign crude oils in the Montreal refining area and in present or potential export markets in the United States.

For purposes of illustration, Redwater crude oil of 35° API has been selected as a typical Canadian crude oil, and its laid-down cost compared with that of crude oil from other sources.

An ocean tanker rate of USMC minus 40 per cent has been assumed in calculating the transportation cost component of offshore imported crude oils. This rate is considered to be representative of present day costs for regular tanker movements. There will, of course, be exceptions both above and below this rate, especially in the case of occasional or spot cargoes.

For purposes of comparison, it has been assumed that Canadian and United States funds are at par of exchange and the price of Redwater crude oil has been adjusted to par of exchange. The laid-down costs used in the comparison are therefore the costs that would be incurred by refiners in the Montreal area with Canadian and United States funds at par of exchange.

Where the usual method of transportation is by ocean tanker, laid-down costs include transportation costs from port of loading to port of discharge, the cost of loading and unloading, and import duties where applicable.

In the case of imported crude oils in the Montreal refining area, cost of transportation is based on the ocean tanker rate from port of loading to Portland, Maine, and includes the pipe line tariff and line loss allowance for shipment to Montreal via the Montreal-Portland Pipe Line. This is the usual method of delivery of offshore crude oils to the Montreal refining area, although some direct deliveries by tanker are made to this area.

Where the usual or proposed method of delivery is by pipe line, transportation costs include only main trunk pipe line charges plus line loss allowance and import duty where applicable. The cost of gathering crude oil to the point of entry into the main trunk line is included in the price of the crude oil. In the case of foreign crude oils, gathering charges are included in the price at port of loading.

In the case of Redwater crude oil the price at Edmonton includes approximately 9 cents per barrel for transportation from the field to Edmonton. For other types of Canadian crude oil, the cost of transportation to Edmonton may vary from 5 cents to 30 cents per barrel, depending on distance of the field from Edmonton.

It will be seen from Exhibit 5 that foreign crude oils can be delivered to all tidewater points shown by tanker at competitive laid-down costs or at a marked competitive advantage, even absorbing in some cases transportation costs in excess of \$1.00 per barrel.

Although the crude oil costs shown in Exhibit 5 may change from time to time, it is probable that their relative costs will remain about the same.

APPENDIX D**PIPE LINE ECONOMICS**

In considering the need for additional pipe line facilities for crude oil transportation from the Prairie Provinces to Ontario and Montreal, we have assumed that Interprovincial Pipe Line would be expanded as additional capacity is required to meet the refinery demands. Our estimates are based on only those facilities that would provide adequate capacity through 1967.

We have predicated our cost estimates on the following assumptions:

(1) The capacity of Interprovincial's system would be increased by building partial loops of large diameter pipe and installing additional pumping equipment where necessary to meet the increased throughput requirements.

(2) The cost of transportation allows sufficient earnings to provide a net return of 8 per cent on the total investment.

(3) Depreciation has been calculated at a rate of 3½ per cent and interest at a maximum rate of 5 per cent.

(4) A rate of 47 per cent has been used for income tax purposes and other taxes have been estimated at 1 per cent of the investment.

In arriving at tariff rates, the cost of transportation, including operating expenses, earnings and income tax, has been allocated to the various segments of the systems on the basis of the total barrel-miles in each segment.

The earning rate for oil pipe lines gives recognition to the fact that the element of risk is relatively higher in the case of crude oil pipe lines as compared with gas transmission lines, since crude oil pipe lines usually operate on the principle of a common carrier, without guaranteed throughput commitments that assure high and constant load factors. By comparison, gas transmission systems generally function as public utilities transmitting their own products and operating with high load factors, which tend to create more economical operations.

CASE I

Upon completion of Interprovincial's present expansion program, sufficient capacity will be available to meet our forecast through 1961.

In order to meet the forecast through 1967, we have assumed the system would be expanded in two steps; first in 1961 to handle demands through 1964, and in 1964 to meet 1967 requirements. By the use of large diameter pipe, only partial looping would be necessary. This would allow further expansion by complete looping, should additional capacity be required to meet increased demand beyond 1967.

CASE II

Case II differs from Case I in that the forecast requirements of Montreal would require the immediate expansion of Interprovincial as well as the extension of the system to Montreal.

The forecast indicates that prior to the increase in refinery facilities in the Toronto area and the reversal of Trans-Northern Pipe Line, the Montreal demand would be 240,000 barrels per day in 1961. With reversal of Trans-Northern, the Montreal demand would decrease to 205,000 barrels per day in 1962 and gradually increase to 261,000 barrels per day in 1967. On this premise we have assumed that Interprovincial would be expanded during 1959-60 to meet forecast demands through 1963.

With the increase in Ontario demands, further expansion would be necessary in 1963 for 1964 requirements. This expansion would be made to provide sufficient capacity to meet 1967 forecasts.

We have also considered the possibility of:

- (1) Expanding Interprovincial to meet the Ontario demand only, and
- (2) Building an independent line from Edmonton to Montreal to handle the Montreal demand only.

This independent line is estimated to cost \$308,930,000, and in addition, it would still be necessary to spend substantial amounts to meet the expanding demand on the Interprovincial system. The tariff rate to Montreal would be 86 cents per barrel in the fifth year of operation, against 75 cents per barrel for the extension of Interprovincial.

The following table summarizes our estimates of investment costs and tariff rates exclusive of pipe lines loss allowance, to meet the forecast demands.

	CASE I		CASE II		Separate Line Edmonton to Montreal
	1962	1967	1961	1967	1961
Estimated take-offs on which tariffs shown below are based (Bbls. per day)					
Sarnia	164,000	204,000	158,000	204,000	—
Toronto	140,000	188,000	86,000	188,000	—
Total Sarnia and Toronto	304,000	392,000	244,000	392,000	—
Montreal	205,000	261,000	240,000	261,000	240,000
Grand total	509,000	653,000	484,000	653,000	240,000
Estimated tariff rate in cents per barrel from Edmonton to:					
Sarnia (64)*	56	54	57	49	—
Toronto (72)*	62	57	62	53	—
Montreal	—	—	75	64	90
Additional capital cost of pipe line facilities on which tariffs are based** (cumulative)	\$24,624,000	\$85,320,000	\$235,252,000	\$291,544,000	\$308,930,000***

NOTES

* Present tariff rates.

** As noted in text, the capital expenditures shown under Case I would be incurred in the years 1961 and 1964 respectively. The capital expenditures shown under Case II would be incurred in 1959-1960 and in 1963 respectively.

*** In addition to the capital cost of \$308,930,000 for a separate line, it would still be necessary to spend substantial amounts to meet the expanding demands on the Inter-provincial system.

We are of the opinion that:

(1) Crude oil from Western Canada could not be delivered to Montreal by pipe line before 1961, and

(2) Interprovincial can be expanded to accommodate increased demands of Ontario and maintain the flexibility of being suitable for extension to Montreal at some future time, should it become desirable from an economic standpoint or national emergency.

APPENDIX E**RESERVES AND EXPLORATORY PROGRAM
REQUIRED FOR ANTICIPATED DEMAND**

Reserves required to meet the total demand for Canadian crude oil, and the exploratory program necessary to meet the various cases of Canadian and export demand previously described, are shown in Schedules XI and XII for the ten-year period 1958 to 1967. A comparison of Cases I and II for the three levels of export demand is demonstrated graphically in Exhibits 2, 3, and 4.

In projecting future crude oil reserves for the various cases of demand considered, it was assumed that initially 1,000 exploratory tests per year would be drilled and that 400,000 barrels of new crude oil reserves would be discovered per test. This is essentially the same discovery rate per test that has been experienced in Western Canada during the period 1951-1957, while the number of exploratory tests assumed to be drilled each year is somewhat less than the 1,058 exploratory tests actually drilled during 1957, but greater than the average for the years 1951 to 1957.

At the 1957 production rate of approximately 500,000 barrels per day the remaining reserve of 2.87 billion barrels at the end of 1957 has an effective life of about 16 years. At the 1957 potential producing rate of 870,000 barrels per day, the remaining reserve has an effective life of about 9 years.

For the projections shown in Schedules XI and XII, at such time as the remaining reserves equivalent to a 10-year supply at current production rates could no longer be maintained at the initial exploratory effort, it was assumed that additional wells were drilled sufficient to assure a ten-year supply. A summary of the data is presented in Schedule X.

Case I

As shown in Schedule XI, anticipated increases in Canadian demand exclusive of the Montreal market and at an export level averaging 100,000 barrels per day (Case IA) or 180,000 barrels per day in 1967 (Case IB) will require an exploratory effort no greater than that experienced during the year 1957. In 1967 the production reaches 828,300 barrels per day in Case IA (68 per cent of potential) and 908,300 barrels per day in Case IB (78 per cent of potential), compared with the anticipated production for 1958 of 466,000 barrels per day or about 54 per cent of the producing potential.

In Case IC, which considers export demand increasing to 480,000 barrels per day in 1967, resulting in a production rate building up to 1.2 million barrels per day at the end of the forecast period, additional exploratory effort would

have to be commenced sometime prior to 1965. During 1967, 1,800 exploratory tests are required to be drilled to assure a ten-year supply of reserves at the 1967 producing rate. For Case IC, 4.681 billion barrels of reserves would be added during the period, resulting in a virgin recoverable reserve of 8.5 billion barrels at the end of 1967.

Case II

The anticipated increases in the demands for Canadian crude oil including the Montreal market will require increased exploratory activity over and above the 1957 level commencing sometime prior to 1966, 1964 and 1961 for Cases IIA, IIB and IIC respectively.

For the maximum export level (Case IIC), the production rate increases to 1.5 million barrels per day and 2,120 exploratory tests are required to be drilled in 1967. In Case IIC, 6.314 billion barrels of new reserves are added during the forecast period, resulting in a virgin recoverable reserve of 10.1 billion barrels by the end of 1967.

APPENDIX F**MAXIMUM ECONOMIC UTILIZATION OF EXISTING
REFINERY AND PIPE LINE FACILITIES**

At the end of 1957, the total refining capacity in the Montreal area was approximately 255,000 barrels per calendar day. The crude oil requirements of refineries in the area are supplied by imported crude oils which for the most part are transported by ocean tanker to Portland, Maine, and thence by pipe line to Montreal through the Montreal-Portland Pipe Line, which has a capacity of approximately 258,000 barrels per day.

In addition to supplying most of the product demands of Quebec, the Montreal refining area in 1958 will supply a portion of the product demands of Ontario to the extent of an estimated crude oil equivalent of 75,000 barrels per day, of which 30,000 barrels per day will be supplied to the Cornwall and Ottawa Valley areas.

Most of this Ontario requirement will be shipped through the Trans-Northern products pipe line, which, at the present time, runs from Montreal to Toronto with a spur line to Ottawa, and an extension from Toronto to Hamilton. The capacity of Trans-Northern, in terms of crude oil equivalent of products transported, is approximately 86,000 barrels per day.

The close proximity of the Cornwall and Ottawa Valley areas to Montreal, coupled with the fact that the product pipe line facilities of Trans-Northern are already supplying these areas make it appear logical that Montreal would continue as their source of supply.

On the other hand, it also appears logical to expect that the main source of supply for products in the area of Ontario west of the junction of Trans-Northern's spur line to Ottawa at Farran's Point which is now being supplied out of Montreal, will shift from Montreal to Toronto by 1962, with the construction of additional new refinery capacity in the Toronto area prior to that date.

In this event, it is expected that Trans-Northern Pipe Line would be reversed as far east as Farran's Point. This reversal of Trans-Northern would eliminate most of the product movement from Montreal into Ontario west of Farran's Point, as refiners in the Toronto area would then have pipe line facilities for supplying this demand out of Toronto.

This shifting of demand from the Montreal to the Toronto refining area would reduce the crude oil requirement of the Montreal refining area to

something in the order of 205,000 barrels per day, and would create surplus refining capacity in the Montreal area, as well as surplus capacity in the Portland-Montreal Pipe Line.

This does not appear to be too serious, as the reduced crude oil requirement of 205,000 barrels per day for the Montreal area in 1962 would be only about 10 per cent less than the estimated crude oil requirements of the area for 1958. The effect of this change in the supply pattern would, therefore, probably be some deferment of refinery expansion in the Montreal area.

The entry of Canadian crude oil into the Montreal area in any substantial volume would probably result in shutting down the Portland-Montreal Pipe Line, at a substantial economic loss to the refiners in Montreal who are the sole shareholders of the companies that operate this line.

In addition, refiners in Montreal either own, or have long-term charter commitments for ocean tankers to supply their crude oil requirements. The idling of these tanker fleets could also result in substantial loss to these refiners.

**CRUDE OIL RESERVES AND PRODUCTION
IN WESTERN CANADA
1951 - 1957**

	Reserves — M. Bbls.			Production			Est. Potential	Prod. Rate as % of Potential	No. of Exploratory Tests	Reserves Per Exploratory Test
	Reserves Added	Remaining Reserve	Virgin Rec. Reserve	Daily Bbls./Day	Annual Bbls./Year	Cumulative Bbls.				
1950	—	1,202,600	1,357,366	77,748	28,378,000	154,766,000	—	—	—	—
1951	220,300	1,375,582	1,577,666	129,639	47,318,000	202,084,000	210,000	61.6	485	455,000
1952	363,409	1,678,491	1,941,075	165,754	60,500,000	262,584,000	265,000	62.5	961	378,000
1953	245,075	1,842,969	2,186,150	220,814	80,597,000	343,181,000	325,000	68.0	906	270,000
1954	457,343	2,205,125	2,643,493	260,787	95,187,000	438,368,000	365,000	71.4	928	483,000
1955	426,605	2,504,758	3,070,098	347,869	126,972,000	565,340,000	535,000	65.0	885	483,000
1956	508,672	2,844,717	3,578,770	462,228	168,713,000	734,053,000	750,000	61.6	899	566,000
1957	205,972	2,869,582	3,784,742	496,184	181,107,000	915,160,000	870,000	57.0	1,058	195,000
										1951-57 Average 404,000

Source of Data:

1. Cumulative Production & Reserves added, Remaining Reserve 1951-1954 Statistical Bulletin C.P.A. Statistical Branch—Fall 1955 Edition.
2. 1955-1957—Annual Report C.P.A. Reserves Committee.

POTENTIAL DOMESTIC MARKETS FOR CANADIAN CRUDE OIL

CASE I

	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
The Province of Ontario excluding Ottawa Valley and also excluding 45,000 barrels per day, ex Montreal 1958-1961 inclusive	(Thousands of Barrels Per Day)									
British Columbia	<u>59.0</u>	<u>72.8</u>	<u>76.8</u>	<u>81.1</u>	<u>85.8</u>	<u>90.3</u>	<u>95.0</u>	<u>100.0</u>	<u>104.9</u>	<u>110.2</u>
Alberta	<u>64.1</u>	<u>71.8</u>	<u>75.4</u>	<u>79.2</u>	<u>83.4</u>	<u>87.4</u>	<u>91.5</u>	<u>95.8</u>	<u>100.2</u>	<u>104.7</u>
Saskatchewan	<u>49.2</u>	<u>53.8</u>	<u>55.0</u>	<u>56.4</u>	<u>58.0</u>	<u>59.3</u>	<u>60.4</u>	<u>61.7</u>	<u>62.9</u>	<u>64.1</u>
Manitoba	<u>34.7</u>	<u>38.7</u>	<u>40.6</u>	<u>42.5</u>	<u>44.4</u>	<u>46.2</u>	<u>47.8</u>	<u>49.8</u>	<u>51.4</u>	<u>53.1</u>
Total Prairie	<u>148.0</u>	<u>164.3</u>	<u>171.0</u>	<u>178.1</u>	<u>185.8</u>	<u>192.9</u>	<u>199.7</u>	<u>207.3</u>	<u>214.5</u>	<u>221.9</u>
Ontario excluding Ottawa Valley	<u>159.0</u>	<u>211.9</u>	<u>231.9</u>	<u>247.8</u>	<u>308.3</u>	<u>324.2</u>	<u>341.0</u>	<u>359.1</u>	<u>377.1</u>	<u>396.2</u>
Total Domestic Demand for Canadian Crude Oil	<u>366.0</u>	<u>449.0</u>	<u>479.7</u>	<u>507.0</u>	<u>579.9</u>	<u>607.4</u>	<u>635.7</u>	<u>666.4</u>	<u>696.5</u>	<u>728.3</u>

CASE II

Domestic Demand Case I	<u>366.0</u>	<u>449.0</u>	<u>479.7</u>	<u>507.0</u>	<u>579.9</u>	<u>607.4</u>	<u>635.7</u>	<u>666.4</u>	<u>696.5</u>	<u>728.3</u>
Quebec including Ottawa Valley	<u>—</u>	<u>—</u>	<u>228.9</u>	<u>239.8</u>	<u>204.9</u>	<u>215.4</u>	<u>226.2</u>	<u>237.9</u>	<u>249.3</u>	<u>261.4</u>
Total Domestic Demand for Canadian Crude Oil	<u>366.0</u>	<u>449.0</u>	<u>708.6</u>	<u>746.8</u>	<u>784.8</u>	<u>822.8</u>	<u>861.9</u>	<u>904.3</u>	<u>945.8</u>	<u>989.7</u>

**POTENTIAL MARKETS FOR CANADIAN CRUDE OIL (DOMESTIC AND EXPORT)
EXCLUDING QUEBEC AND OTTAWA VALLEY**

CASE IA

	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
Exports 100,000 barrels per day										
(Thousands of Barrels Per Day)										
The Province of Ontario excluding Ottawa Valley and also excluding 45,000 barrels per day ex Montreal 1958-1961 inclusive										
Export Demand	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Canadian Domestic Demand Case I	<u>366.0</u>	<u>449.0</u>	<u>479.7</u>	<u>507.0</u>	<u>579.9</u>	<u>607.4</u>	<u>635.7</u>	<u>666.4</u>	<u>696.5</u>	<u>728.3</u>
Total Demand for Canadian Crude Oil	<u>466.0</u>	<u>549.0</u>	<u>579.7</u>	<u>607.0</u>	<u>679.9</u>	<u>707.4</u>	<u>735.7</u>	<u>766.4</u>	<u>796.5</u>	<u>828.3</u>

CASE IB

Exports 40,000 barrels per day in 1958, building up to 120,000 barrels per day in Pacific North West and 60,000 barrels per day constant in Mid West

Export Demand	100.0	108.0	117.0	125.0	134.0	143.0	152.0	160.0	170.0	180.0
Canadian Domestic Demand Case I	<u>366.0</u>	<u>449.0</u>	<u>479.7</u>	<u>507.0</u>	<u>579.9</u>	<u>607.4</u>	<u>635.7</u>	<u>666.4</u>	<u>696.5</u>	<u>728.3</u>
Total Demand for Canadian Crude Oil	<u>466.0</u>	<u>557.0</u>	<u>596.7</u>	<u>632.0</u>	<u>713.9</u>	<u>750.4</u>	<u>787.7</u>	<u>826.4</u>	<u>866.5</u>	<u>908.3</u>

CASE IC

Exports 40,000 barrels per day in 1958 to 420,000 barrels per day in 1967 on West Coast and 60,000 barrels per day constant in Mid West

The Province of Ontario excluding Ottawa Valley and also excluding 45,000 barrels per day ex Montreal 1958-1961 inclusive

Export Demand	100.0	140.0	185.0	225.0	270.0	310.0	350.0	395.0	435.0	480.0
Canadian Domestic Demand Case I	<u>366.0</u>	<u>449.0</u>	<u>479.7</u>	<u>507.0</u>	<u>579.9</u>	<u>607.4</u>	<u>635.7</u>	<u>666.4</u>	<u>696.5</u>	<u>728.3</u>
Total Demand for Canadian Crude Oil	<u>466.0</u>	<u>589.0</u>	<u>664.7</u>	<u>732.0</u>	<u>849.9</u>	<u>917.4</u>	<u>985.7</u>	<u>1,061.4</u>	<u>1,131.5</u>	<u>1,208.3</u>

**POTENTIAL MARKETS FOR CANADIAN CRUDE OIL (DOMESTIC AND EXPORT)
INCLUDING QUEBEC AND OTTAWA VALLEY**

CASE IIA

	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
Exports 100,000 barrels per day										
The Provinces of Ontario and Quebec				(Thousands of Barrels Per Day)						
Export Demand	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Canadian Domestic Demand Case II	366.0	449.0	708.6	746.8	784.8	822.8	861.9	904.3	945.8	989.7
Total Demand for Canadian Crude Oil	<u>466.0</u>	<u>549.0</u>	<u>808.6</u>	<u>846.8</u>	<u>884.8</u>	<u>922.8</u>	<u>961.9</u>	<u>1,004.3</u>	<u>1,045.8</u>	<u>1,089.7</u>

CASE IIB

Exports 40,000 barrels per day in 1958, building up to 120,000 barrels per day in Pacific North West and 60,000 barrels per day constant in Mid West

The Provinces of Ontario and Quebec										
Export Demand	100.0	108.0	117.0	125.0	134.0	143.0	152.0	160.0	170.0	180.0
Canadian Domestic Demand Case II	366.0	449.0	708.6	746.8	784.8	822.8	861.9	904.3	945.8	989.7
Total Demand for Canadian Crude Oil	<u>466.0</u>	<u>557.0</u>	<u>825.6</u>	<u>871.8</u>	<u>918.8</u>	<u>965.8</u>	<u>1,013.9</u>	<u>1,064.3</u>	<u>1,115.8</u>	<u>1,169.7</u>

CASE IIC

Exports 40,000 barrels per day in 1958 to 420,000 barrels per day in 1967 on West Coast and 60,000 barrels per day constant in Mid West

The Provinces of Ontario and Quebec										
Export Demand	100.0	140.0	185.0	225.0	270.0	310.0	350.0	395.0	435.0	480.0
Canadian Domestic Demand Case II	366.0	449.0	708.6	746.8	784.8	822.8	861.9	904.3	945.8	989.7
Total Demand for Canadian Crude Oil	<u>466.0</u>	<u>589.0</u>	<u>893.6</u>	<u>971.8</u>	<u>1,054.8</u>	<u>1,132.8</u>	<u>1,211.9</u>	<u>1,299.3</u>	<u>1,380.8</u>	<u>1,469.7</u>

SUMMARY OF CRUDE OIL DEMAND AND PRODUCT SUPPLY
ALL CANADA EXCLUDING THE ATLANTIC PROVINCES
1958
(THOUSANDS OF BARRELS PER DAY)

	Potential Market for Foreign Crude Oil	Potential Domestic Market for Canadian Crude Oil	Refinery Fuel & Loss	Product Yields from Canadian Crude Oil	Product Yields from Foreign Crude Oil	Apparent Reduction in Inventories (See Note)	Imports Required to Balance Refinery Yields		Total Supply and Demand
							Middle Distillate	Residual	
British Columbia	---	59.0	5.3	53.7	---	9.2	3.6	10.4	76.9
Alberta	---	64.1							
Saskatchewan	---	49.2							
Manitoba	---	34.7							
Total Prairie	---	148.0	12.0	136.0	---	9.3	---	---	145.3
Ontario excluding Ottawa Valley	21.0	159.0	16.2	144.7	19.1	17.3	3.5	0.2	184.8
Quebec including Ottawa Valley	234.3	---	21.1	---	213.2	---	8.5	26.3	248.0
Total Ontario & Quebec	255.3	159.0	37.3	144.7	232.3	17.3	12.0	26.5	432.8
Total All Canada excluding Atlantic Provinces	255.3	366.0	54.6	334.4	232.3	35.8	15.6	36.9	655.0

Note: Apparent reduction in inventories may include imported products in excess of volumes required to balance refinery yields against market demands, that is product which would be available from Canadian refineries. It may also reflect differences between our own forecast of industry demand for 1958 and the aggregate of the individual company forecasts on which estimates of crude oil requirements have been based.

**SUMMARY OF CRUDE OIL DEMAND AND PRODUCT SUPPLY
ALL CANADA EXCLUDING THE ATLANTIC PROVINCES
1962 — MONTREAL ON FOREIGN CRUDE OIL
(THOUSANDS OF BARRELS PER DAY)**

	Potential Market for Foreign Crude Oil	Potential Domestic Market for Canadian Crude Oil	Refinery Fuel & Loss	Product Yields from Canadian Crude Oil	Product Yields from Foreign Crude Oil	Imports Required to Balance Refinery Yields		Total Supply and Demand
						Middle Distillate	Residual	
British Columbia	---	85.8	7.7	78.1	---	14.5	14.7	107.3
Alberta	---	83.4						
Saskatchewan	---	58.0						
Manitoba	---	44.4						
Total Prairie	---	185.8	14.9	170.9	---	9.3	4.4	184.6
Ontario excluding Ottawa Valley	---	308.3	27.7	280.6	---	9.3	12.1	302.0
Quebec including Ottawa Valley	222.6	---	20.0	---	202.6	24.7	40.7	268.0
Total Ontario & Quebec	222.6	308.3	47.7	280.6	202.6	34.0	52.8	570.0
Total All Canada excluding Atlantic Provinces	222.6	579.9	70.3	529.6	202.6	57.8	71.9	861.9

PRAIRIE PROVINCES CONSIDERED AS ONE SUPPLY AREA

**SUMMARY OF CRUDE OIL DEMAND AND PRODUCT SUPPLY
ALL CANADA EXCLUDING THE ATLANTIC PROVINCES
1962 — MONTREAL ON CANADIAN CRUDE OIL
(THOUSANDS OF BARRELS PER DAY)**

	Potential Domestic Market for Canadian Crude Oil	Refinery Fuel & Loss	Product Yields from Canadian Crude Oil	Imports Required to Balance Refinery Yields		Total Supply and Demand
				Middle Distillate	Residual	
British Columbia	85.8	7.7	78.1	14.5	14.7	107.3
Alberta	83.4					
Saskatchewan	58.0	PRAIRIE PROVINCES CONSIDERED AS ONE SUPPLY AREA				
Manitoba	44.4					
Total Prairie	185.8	14.9	170.9	9.3	4.4	184.6
Ontario excluding Ottawa Valley	308.3	27.7	280.6	9.3	12.1	302.0
Quebec including Ottawa Valley	204.9	18.4	186.5	37.0	44.5	268.0
Total Ontario & Quebec	513.2	46.1	467.1	46.3	56.6	570.0
Total All Canada excluding Atlantic Provinces	784.8	68.7	716.1	70.1	75.7	861.9

	Potential Market for Foreign Crude Oil	Potential Domestic Market for Canadian Crude Oil	Refinery Fuel & Loss	Product Yields from Canadian Crude Oil	Product Yields from Foreign Crude Oil	Imports Required to Balance Refinery Yields		Total Supply and Demand
						Middle Distillate	Residual	
British Columbia	---	110.2	9.9	100.3	---	25.6	9.2	135.1
Alberta	---	104.7						
Saskatchewan	---	64.1	PRAIRIE PROVINCES CONSIDERED AS ONE SUPPLY AREA					
Manitoba	---	53.1						
Total Prairie	---	221.9	17.9	204.0	---	23.7	(2.3)	225.4
Ontario excluding Ottawa Valley	---	396.2	35.7	360.5	---	9.2	11.8	381.5
Quebec including Ottawa Valley	283.8	---	25.5	---	258.3	39.0	46.1	343.4
Total Ontario & Quebec	283.8	396.2	61.2	360.5	258.3	48.2	57.9	724.9
Total All Canada excluding Atlantic Provinces	283.8	728.3	89.0	664.8	258.3	97.5	64.8	1,085.4

**SUMMARY OF CRUDE OIL DEMAND AND PRODUCT SUPPLY
ALL CANADA EXCLUDING THE ATLANTIC PROVINCES
1967 — MONTREAL ON CANADIAN CRUDE OIL
(THOUSANDS OF BARRELS PER DAY)**

	Potential Domestic Market for Canadian Crude Oil	Refinery Fuel & Loss	Product Yields from Canadian Crude Oil	Imports Required to Balance Refinery Yields		Total Supply and Demand
				Middle Distillate	Residual	
British Columbia	110.2	9.9	100.3	25.6	9.2	135.1
Alberta	104.7					
Saskatchewan	64.1					
Manitoba	53.1					
	PRAIRIE PROVINCES CONSIDERED AS ONE SUPPLY AREA					
Total Prairie	221.9	17.9	204.0	23.7	(2.3)	225.4
Ontario excluding Ottawa Valley	396.2	35.7	360.5	9.2	11.8	381.5
Quebec including Ottawa Valley	261.4	23.6	237.8	54.7	50.9	343.4
Total Ontario & Quebec	657.6	59.3	598.3	63.9	62.7	724.9
Total All Canada excluding Atlantic Provinces	989.7	87.1	902.6	113.2	69.6	1,085.4

PRODUCTION, PRODUCING POTENTIAL, EXPLORATORY PROGRAM AND REQUIRED RESERVES

CASE I (Excluding Montreal Market)

(Demands Shown in Thousands of Barrels Per Day—Reserves in Billions of Barrels)

	Case IA			Case IB			Case IC		
	<u>1958</u>	<u>1962</u>	<u>1967</u>	<u>1958</u>	<u>1962</u>	<u>1967</u>	<u>1958</u>	<u>1962</u>	<u>1967</u>
Domestic demand	366	580	728	366	580	728	366	580	728
Export demand	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>134</u>	<u>180</u>	<u>100</u>	<u>270</u>	<u>480</u>
Total demand	<u>466</u>	<u>680</u>	<u>828</u>	<u>466</u>	<u>714</u>	<u>908</u>	<u>466</u>	<u>850</u>	<u>1,208</u>
Production rate as per cent of potential	54	65	68	54	68	78	54	85	100
Exploratory wells per year	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,800
Year in which production reaches 100% of potential		—			—			1965	
New reserves added in ten-year period		4.0			4.0			4.7	

CASE II (Including Montreal Market)

(Demands Shown in Thousands of Barrels Per Day—Reserves in Billions of Barrels)

	Case IIA			Case IIB			Case IIC		
	<u>1958</u>	<u>1962</u>	<u>1967</u>	<u>1958</u>	<u>1962</u>	<u>1967</u>	<u>1958</u>	<u>1962</u>	<u>1967</u>
Domestic demand	366	785	990	366	785	990	366	785	990
Export demand	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>134</u>	<u>180</u>	<u>100</u>	<u>270</u>	<u>480</u>
Total demand	<u>466</u>	<u>885</u>	<u>1,090</u>	<u>466</u>	<u>919</u>	<u>1,170</u>	<u>466</u>	<u>1,055</u>	<u>1,470</u>
Production rate as per cent of potential	54	90	100	54	95	100	54	100	100
Exploratory wells per year	1,000	1,000	1,398	1,000	1,000	1,555	1,000	1,720	2,120
Year in which production reaches 100% of potential		1966			1964			1961	
New reserves added in ten-year period		4.2			4.7			6.3	

RESERVES AND EXPLORATORY PROGRAM REQUIRED FOR ANTICIPATED DEMAND

CASE	YEAR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		Crude Oil Production			Ten Year	Exploratory	Reserve	Net Reserve	Remaining	Cumulative	Producing	Prod. Rate
		Daily	Annual	Cumulative	Reserve at	Wells	Additions	Additions	Reserve	Virgin	Potential	As % of
		B/D	B/Yr.	M ² Bbls.	Yearly Prod.	Drilled	(5) x 400,000	(6) — (2)	Year End	Reserve	(8) x 10 %	Prod. Pot.
			M ² Bbls.	M ² Bbls.	M ² Bbls.	in Year	M ² Bbls.	M ² Bbls.	M ² Bbls.	M ² Bbls.	365 B/D	[(1) ÷ (10)] 100
I - A	1957	—	—	915.16	—	—	—	—	2,870	3,785	—	—
	1958	466,000	170.09	1,085.25	1,701	1,000	400	230	3,100	4,185	870,000	54
	1959	549,000	200.39	1,285.64	2,004	1,000	400	200	3,300	4,585	905,000	61
	1960	579,700	211.59	1,497.23	2,116	1,000	400	188	3,488	4,985	955,000	61
	1961	607,000	221.56	1,718.79	2,216	1,000	400	178	3,666	5,385	1,000,000	61
	1962	679,900	248.16	1,966.95	2,482	1,000	400	152	3,818	5,785	1,040,000	65
	1963	707,400	258.20	2,225.15	2,582	1,000	400	142	3,960	6,185	1,085,000	65
	1964	735,700	268.53	2,493.68	2,685	1,000	400	131	4,091	6,585	1,120,000	66
	1965	766,400	279.74	2,773.42	2,797	1,000	400	120	4,211	6,985	1,150,000	67
	1966	796,500	290.72	3,064.14	2,907	1,000	400	109	4,320	7,385	1,185,000	67
	1967	828,300	302.33	3,366.47	3,023	1,000	400	98	4,418	7,785	1,210,000	68
I - B	1957	—	—	915.16	—	—	—	—	2,870	3,785	—	—
	1958	466,000	170.09	1,085.25	1,701	1,000	400	230	3,100	4,185	870,000	54
	1959	557,000	203.31	1,288.56	2,033	1,000	400	197	3,297	4,585	900,000	62
	1960	596,700	217.80	1,506.36	2,178	1,000	400	182	3,479	4,985	950,000	63
	1961	632,000	230.68	1,737.04	2,307	1,000	400	169	3,648	5,385	1,000,000	63
	1962	713,900	260.57	1,997.61	2,606	1,000	400	139	3,787	5,785	1,040,000	68
	1963	750,400	273.90	2,271.51	2,739	1,000	400	126	3,913	6,185	1,070,000	70
	1964	787,700	287.51	2,559.02	2,875	1,000	400	112	4,025	6,585	1,100,000	72
	1965	826,400	301.64	2,860.66	3,016	1,000	400	98	4,123	6,985	1,130,000	73
	1966	866,500	316.27	3,176.93	3,163	1,000	400	84	4,207	7,385	1,150,000	75
	1967	908,300	331.53	3,508.46	3,315	1,000	400	68	4,275	7,785	1,170,000	78
I - C	1957	—	—	915.16	—	—	—	—	2,870	3,785	—	—
	1958	466,000	170.09	1,085.25	1,701	1,000	400	230	3,100	4,185	870,000	54
	1959	589,000	214.99	1,300.24	2,150	1,000	400	185	3,285	4,585	900,000	65
	1960	664,700	242.62	1,542.86	2,426	1,000	400	157	3,442	4,985	945,000	70
	1961	732,000	267.18	1,810.04	2,672	1,000	400	133	3,575	5,385	980,000	75
	1962	849,900	310.21	2,120.25	3,102	1,000	400	90	3,665	5,785	1,000,000	85
	1963	917,400	334.85	2,455.10	3,349	1,000	400	65	3,730	6,185	1,020,000	90
	1964	985,700	359.78	2,814.88	3,598	1,000	400	40	3,770	6,585	1,030,000	96
	1965	1,061,400	387.41	3,202.29	3,874	1,230	491	104	3,874	7,076	1,061,400	100
	1966	1,131,500	413.00	3,615.29	4,130	1,670	669	256	4,130	7,745	1,131,500	100
	1967	1,208,300	441.03	4,056.32	4,410	1,800	721	280	4,410	8,466	1,208,300	100

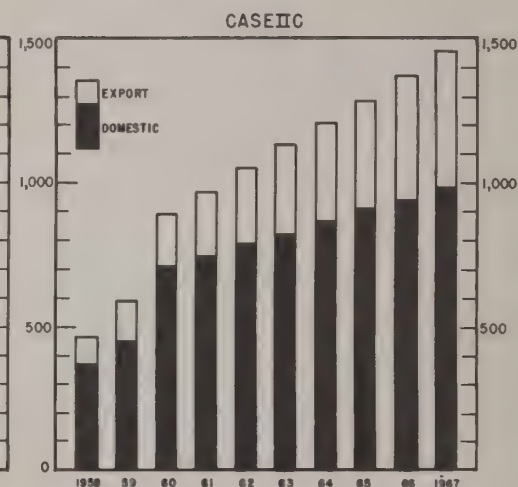
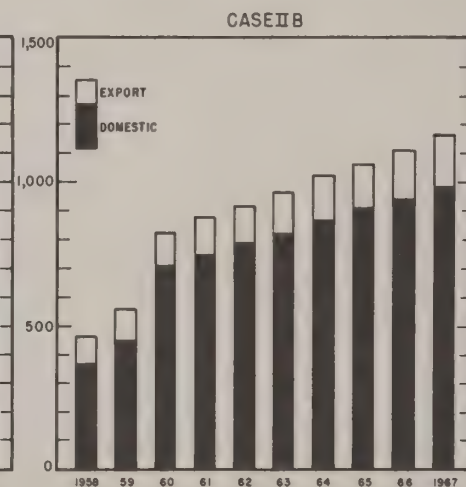
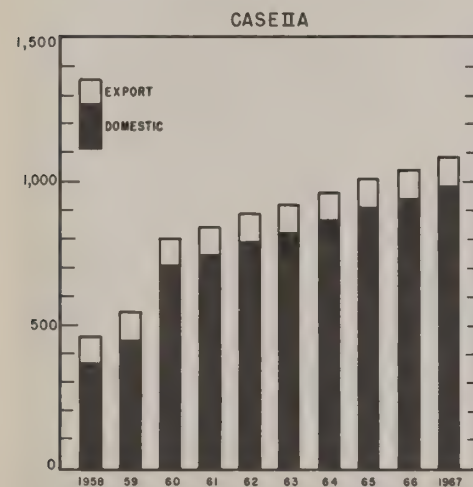
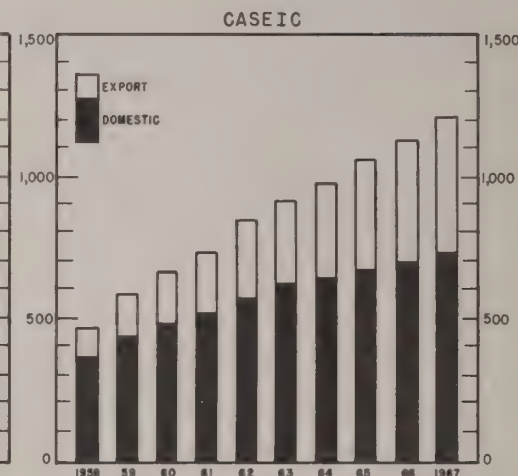
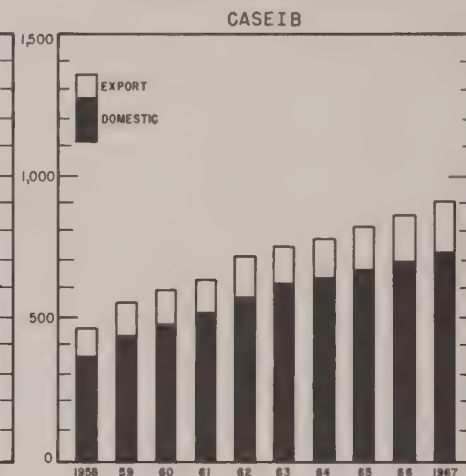
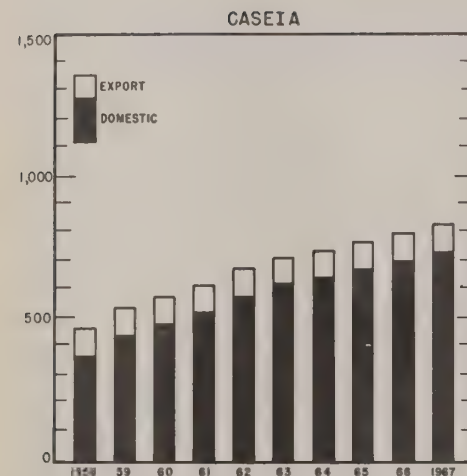
RESERVES AND EXPLORATORY PROGRAM REQUIRED FOR ANTICIPATED DEMAND

CASE	YEAR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		Crude Oil Production			Ten Year Reserve at Yearly Prod. M ² Bbls.	Exploratory Wells Drilled in Year	Reserve Additions (5) x 400,000 M ² Bbls.	Net Reserve Additions (6) — (2) M ² Bbls.	Remaining Reserve Year End M ² Bbls.	Cumulative Virgin Reserve M ² Bbls.	Producing Potential (8) x 10 % 365	Prod. Rate As % of Prod. Pot. [(1) ÷ (10)] 100
		B/D	B/Yr. M ² Bbls.	Cumulative M ² Bbls.								
II - A	1957	---	---	915.16	---	---	---	---	2,870	3,785	---	---
	1958	466,000	170.09	1,085.25	1,701	1,000	400	230	3,100	4,185	870,000	54
	1959	549,000	200.39	1,285.64	2,004	1,000	400	200	3,300	4,585	904,000	61
	1960	808,600	295.14	1,580.78	2,951	1,000	400	105	3,405	4,985	933,000	87
	1961	846,800	309.08	1,889.86	3,091	1,000	400	91	3,496	5,385	957,000	89
	1962	884,800	322.95	2,212.81	3,230	1,000	400	77	3,573	5,785	980,000	90
	1963	922,800	336.82	2,549.63	3,368	1,000	400	63	3,636	6,185	995,000	93
	1964	961,900	351.09	2,900.72	3,511	1,000	400	49	3,685	6,585	1,008,000	95
	1965	1,004,300	366.57	3,267.29	3,666	1,000	400	33	3,718	6,985	1,017,000	99
	1966	1,045,800	381.72	3,649.01	3,817	1,210	481	99	3,817	7,466	1,045,800	100
	1967	1,089,700	397.74	4,046.75	3,977	1,398	558	160	3,977	8,024	1,089,700	100
II - B	1957	---	---	915.16	---	---	---	---	2,870	3,785	---	---
	1958	466,000	170.09	1,085.25	1,701	1,000	400	230	3,100	4,185	870,000	54
	1959	557,000	203.31	1,288.56	2,033	1,000	400	197	3,297	4,585	904,000	62
	1960	825,600	301.34	1,589.90	3,013	1,000	400	99	3,396	4,985	930,000	89
	1961	871,800	318.21	1,908.11	3,182	1,000	400	82	3,478	5,385	953,000	92
	1962	918,800	335.36	2,243.47	3,354	1,000	400	65	3,543	5,785	970,000	95
	1963	965,800	352.52	2,595.99	3,525	1,000	400	48	3,591	6,185	983,000	98
	1964	1,013,900	370.07	2,966.06	3,701	1,200	480	110	3,701	6,665	1,013,900	100
	1965	1,064,300	388.47	3,354.53	3,885	1,430	572	184	3,885	7,237	1,064,300	100
	1966	1,115,800	407.27	3,761.80	4,073	1,490	595	188	4,073	7,832	1,115,800	100
	1967	1,169,700	426.94	4,188.74	4,269	1,555	623	196	4,269	8,455	1,169,700	100
II - C	1957	---	---	915.16	---	---	---	---	2,870	3,785	---	---
	1958	466,000	170.09	1,085.25	1,701	1,000	400	230	3,100	4,185	870,000	54
	1959	589,000	214.99	1,300.24	2,150	1,000	400	185	3,285	4,585	900,000	65
	1960	893,600	326.16	1,626.40	3,262	1,000	400	74	3,359	4,985	920,000	97
	1961	971,800	354.71	1,981.11	3,547	1,360	543	188	3,547	5,528	971,800	100
	1962	1,054,800	385.00	2,366.11	3,850	1,720	688	303	3,850	6,216	1,054,800	100
	1963	1,132,800	413.47	2,779.58	4,135	1,745	698	285	4,135	6,914	1,132,800	100
	1964	1,211,900	442.34	3,221.92	4,423	1,825	730	288	4,423	7,644	1,211,900	100
	1965	1,299,300	474.24	3,696.16	4,742	1,980	793	319	4,742	8,437	1,299,300	100
	1966	1,380,800	503.99	4,200.15	5,040	2,010	804	300	5,042	9,241	1,380,800	100
	1967	1,469,700	536.44	4,736.59	5,364	2,120	858	322	5,364	10,099	1,469,700	100

POTENTIAL MARKETS (DOMESTIC & EXPORT) FOR CANADIAN CRUDE OIL

EXHIBIT 1

1958-1967
THOUSANDS OF BARRELS PER DAY

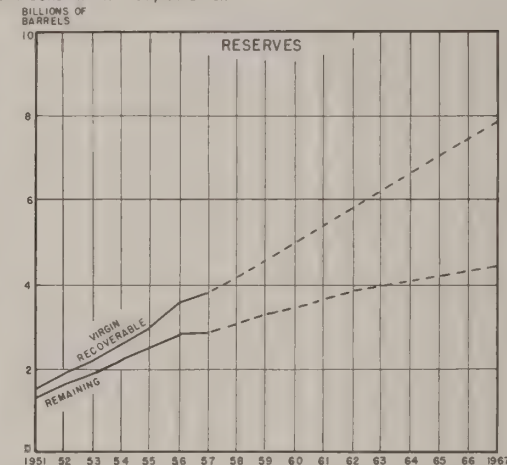
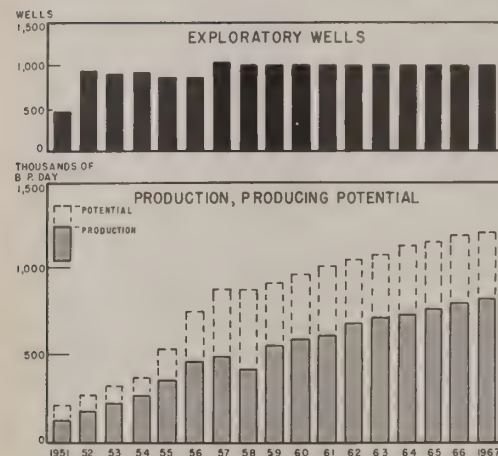


EXPLORATORY WELLS—PRODUCTION, PRODUCING POTENTIAL RESERVES

WESTERN CANADA

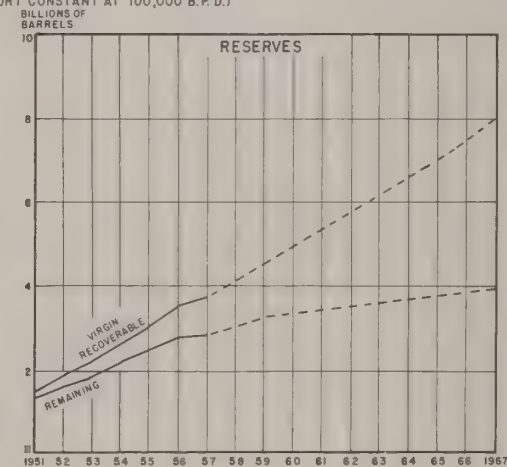
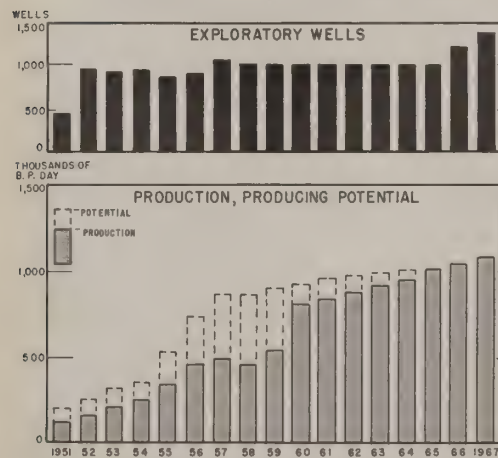
CASE I A

(EXCLUDING MONTREAL — EXPORT CONSTANT AT 100,000 B.P.D.)



CASE II A

(INCLUDING MONTREAL — EXPORT CONSTANT AT 100,000 B.P.D.)

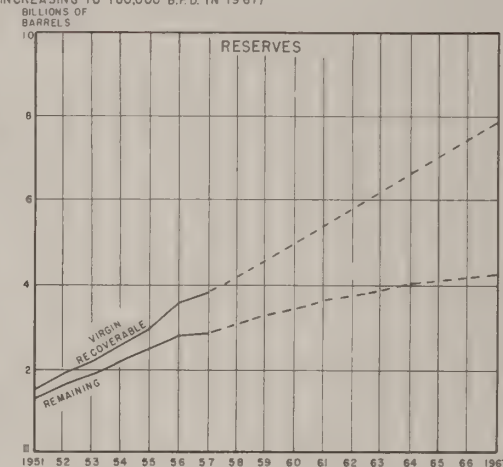
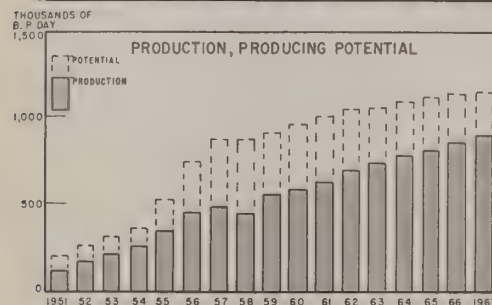
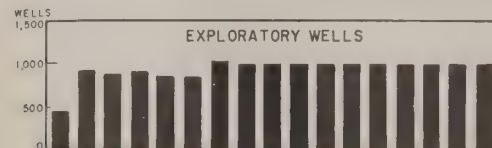


EXPLORATORY WELLS—PRODUCTION, PRODUCING POTENTIAL RESERVES

WESTERN CANADA

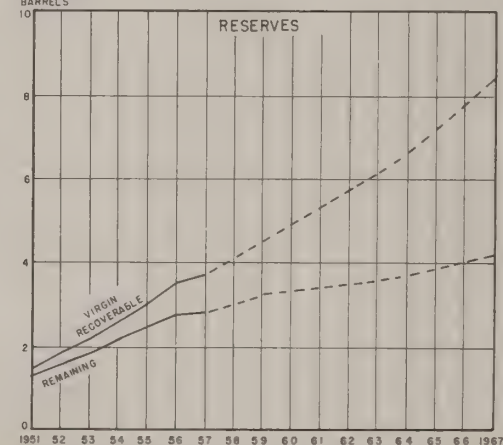
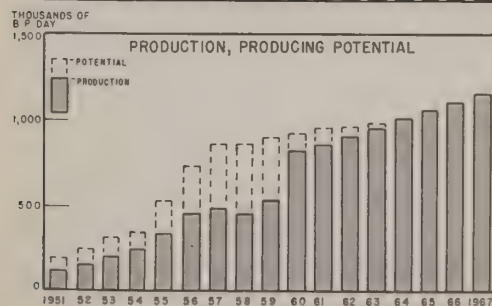
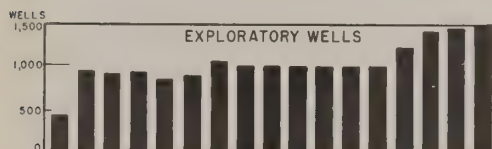
CASE I B

(EXCLUDING MONTREAL—EXPORT INCREASING TO 180,000 B.P.D. IN 1967)



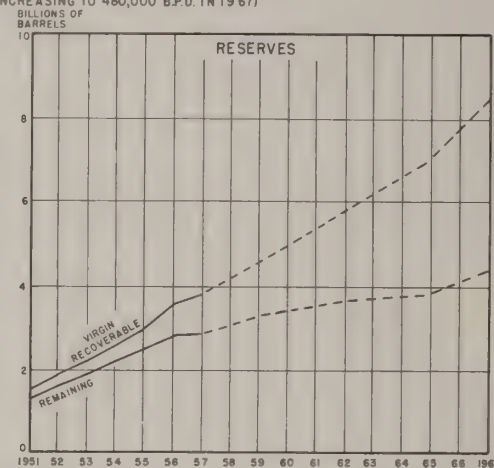
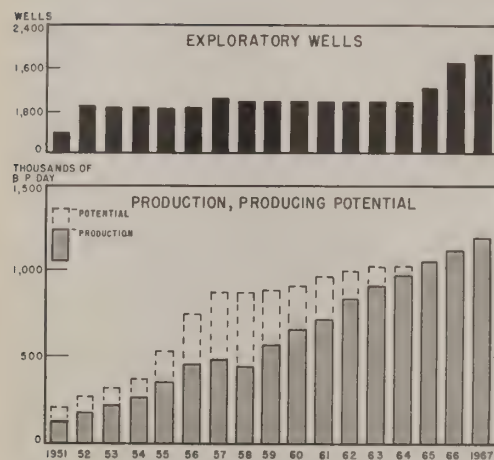
CASE II B

(INCLUDING MONTREAL—EXPORT INCREASING TO 180,000 B.P.D. IN 1967)

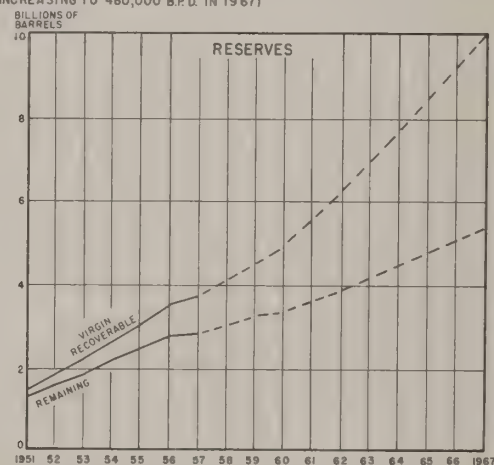
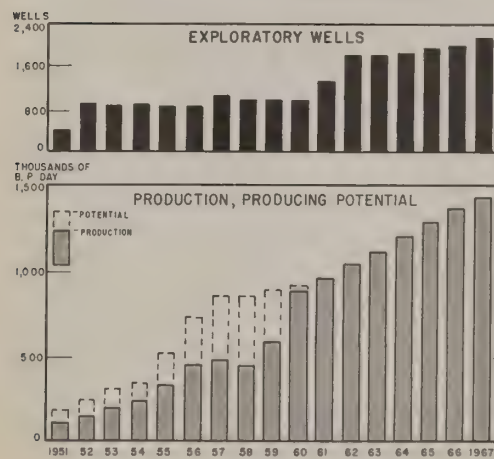


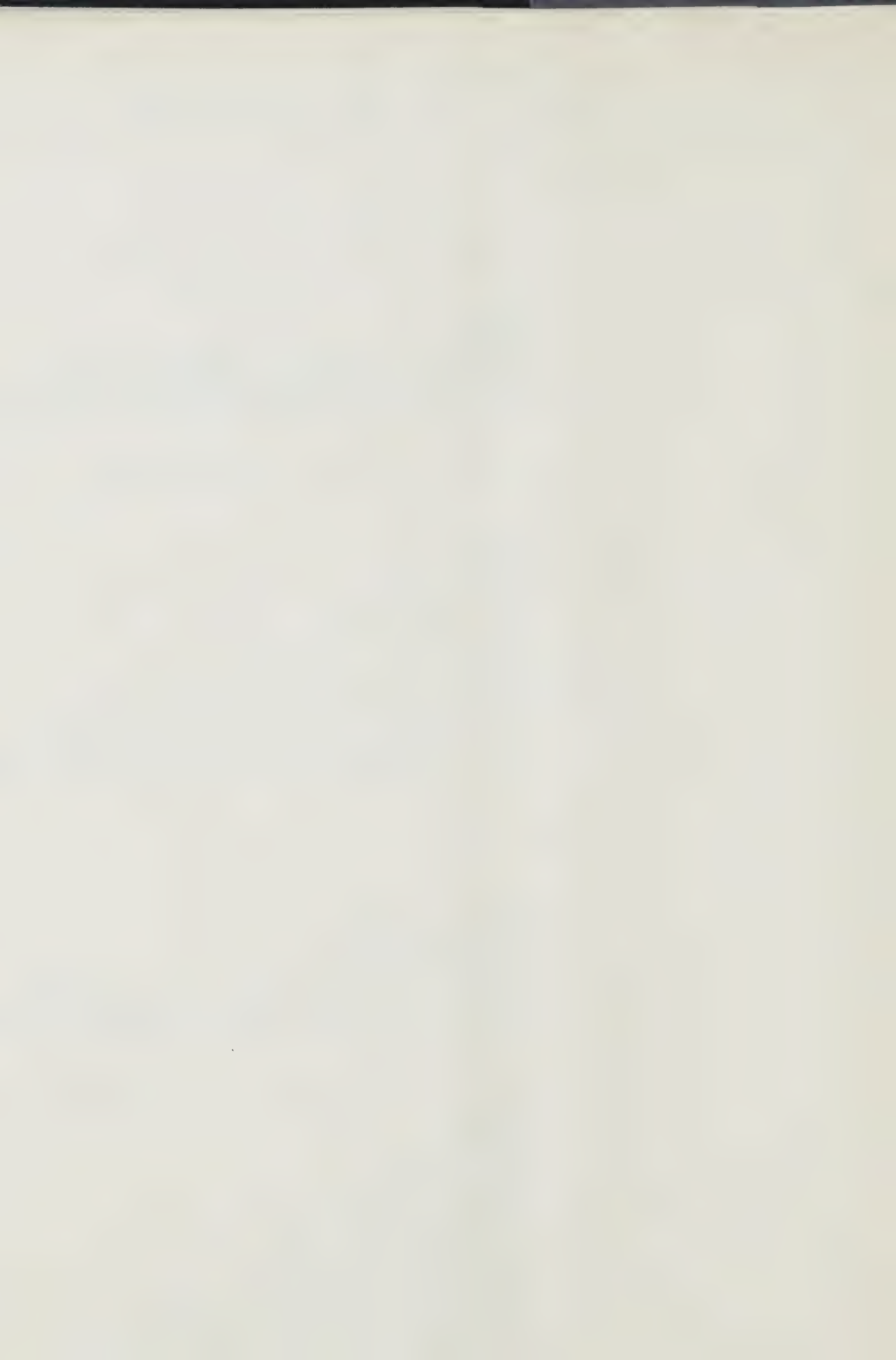
EXPLORATORY WELLS—PRODUCTION, PRODUCING POTENTIAL RESERVES WESTERN CANADA

CASE I C
(EXCLUDING MONTREAL — EXPORT INCREASING TO 480,000 B.P.D. IN 1967)



CASE II C
(INCLUDING MONTREAL — EXPORT INCREASING TO 480,000 B.P.D. IN 1967)





COMPARATIVE LAID~DOWN COSTS

EXHIBIT 5

